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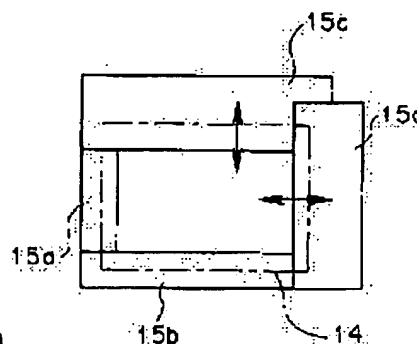
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(54) MULTI-DISPLAY DEVICE, MULTI-DISPLAY SYSTEM AND ADJUSTMENT METHOD FOR MULTI-DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a multi-display device or the like for observing an image constituted of plural partial images at almost uniform luminance even in a superimposing area.

SOLUTION: This multi-display device is provided with plural projectors and is composed so as to constitute one image as the whole by arraying the partial images projected to a screen by the projectors while superimposing them on the partial images adjacent at the side edge in the superimposing area. In a light shielding plate for light-shielding a part of a luminous flux projected to the superimposing area so as to almost match the luminance of the superimposing area with the luminance of the partial image excluding the superimposing area, a light shielding part 15d for light-shielding a right side opposing the light-shielding part 15a for light-shielding the left side of a projection range 14 regarding the partial image can be displaced in a horizontal direction. Similarly, the light-shielding part 15c for light-shielding an upper side opposing the light-shielding part 15b for light-shielding a lower side can be displaced in a vertical direction.



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CLAIMS

[Claim(s)]

[Claim 1] Multi-display equipment characterized by providing or including the following. Two or more picture projection means. It is multi-display equipment made as [constitute / one picture / as a whole / by arranging laying the partial picture projected on the screen by this picture projection means with a superposition field on top of the partial picture which adjoins in the verge]. The quantity of light regulation means made as [carry out / the variation rate of the quantity of light region of accommodation of other verge to one verge of the partial picture which adjusts the quantity of light of the flux of light projected towards this superposition field in order to carry out abbreviation coincidence of the brightness of the above-mentioned superposition field with the brightness of the partial picture except this superposition field, and is projected].

[Claim 2] It is multi-display equipment according to claim 1 which the above-mentioned quantity of light regulation means may make carry out the variation rate of the quantity of light region of accommodation of two or more verge concerning the partial picture projected, and is characterized by the direction of these variation rates including the two or more directions of [of the 2-ways and hands of cut within the field which intersects the flux of light projected from the above-mentioned picture projection means which became independent mutually].

[Claim 3] At least one of two or more above-mentioned picture projection means It is arranged so that the picture projection direction may intersect the normal stood to the principal plane of a screen. the above-mentioned quantity of light regulation means So that the quantity of light of the portion used as a difference with the partial picture at the time of projecting in the direction of a normal which stood this picture projection means of the partial pictures projected by this picture projection means to the principal plane of a screen may be adjusted Multi-display equipment according to claim 1 characterized by being that to which the variation rate of the quantity of light region of accommodation is carried out.

[Claim 4] The above-mentioned quantity of light regulation means is multi-display equipment according to claim 1 which has the configuration section for carrying out abbreviation coincidence of the brightness of the superposition field which the partial picture projected by three or more picture projection means comes to pile up with the brightness of the partial picture except this superposition field, and is characterized by the bird clapper.

[Claim 5] The above-mentioned quantity of light regulation means is multi-display equipment according to claim 1 characterized by being what constituted so that it may come to have the gobo which shades a part of flux of light [at least] projected towards a superposition field one or more and the gobo of at least 1 may become movable.

[Claim 6] The above-mentioned quantity of light regulation means is multi-display equipment according to claim 1 characterized by being what constituted so that it may come to have the dimming filter as for which permeability or a reflection factor becomes continuous highly stair-like one or more and the dimming filter of at least 1 may become movable from the verge toward a center.

[Claim 7] The display device as which the above-mentioned picture projection means displays a picture,

and a lighting means to illuminate this display device, It comes to have the incident-light study system which projects the picture on the display device illuminated by this lighting means. the above-mentioned quantity of light regulation means Multi-display equipment according to claim 1 which is arranged on the optical path from the above-mentioned lighting means to an incident-light study system, has the liquid crystal panel for quantity of light regulation which performs at least a switch of shading of the flux of light projected on the above-mentioned superposition field, and light transmission, or one side of change of permeability, and is characterized by the bird clapper.

[Claim 8] Multi-display equipment according to claim 1 characterized by providing further a fixed means to fix in one to maintain the above-mentioned quantity of light regulation means and the above-mentioned picture projection means in a position relation.

[Claim 9] The multi-display system characterized by providing the following. Multi-display equipment given in any 1 term of a claim 1 to the claim 8. An image pck-up means to picturize the picture projected on the screen of this multi-display equipment. A brightness detection means to extract a luminance signal from the image pck-up signal of this image pck-up means, and to detect the size and brightness of the above-mentioned superposition field. An amount operation means of gaps to which the variation rate of the above-mentioned quantity of light region of accommodation should be further carried out by the above-mentioned quantity of light regulation means based on the output of this brightness detection means to shift and to calculate an amount, and control means controlled to carry out the variation rate of the to shift and according to above-mentioned quantity of light regulation means based on amount quantity of light region of accommodation calculated by this amount operation means of gaps.

[Claim 10] The adjustment method of multi-display equipment given in any 1 term of a claim 1 to the claim 8 characterized by providing the following. The step which picturizes the picture projected on the screen of the above-mentioned multi-display equipment, and outputs an image pck-up signal. The step which extracts a luminance signal from the above-mentioned image pck-up signal, and detects the size and brightness of the above-mentioned superposition field. The step to which the variation rate of the quantity of light region of accommodation should be further carried out based on the information on the size and brightness of the detected superposition field by the quantity of light regulation means of the above-mentioned multi-display equipment and which shifts and calculates an amount. The step controlled based on the above-mentioned amount of gaps to carry out the variation rate of the quantity of light region of accommodation by the above-mentioned quantity of light regulation means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the adjustment method of the multi-display equipment which constitutes one picture as a whole, a multi-display system, and multi-display equipment by arranging the adjustment method of multi-display equipment, a multi-display system, and multi-display equipment, and the partial picture projected by two or more picture projection meanses in more detail.

[0002]

[Description of the Prior Art] That as which various things are proposed from before, for example, the multi-display equipment which displays the picture of one sheet using the image display equipment which is two or more picture projection meanses was indicated to be by JP,5-103286,A, JP,3-53288,A, JP,9-211386,A, JP,6-169444,A, etc. is mentioned as an example.

[0003] The gobo which shades the edge of the projection range by the projector is arranged, and it is made to dim between image display equipment (projector) and a screen the quantity of light so that it may consist of such conventional multi-display equipment so that the knot portion of the pictures projected by two or more image display equipments may be overlapped mutually (references, such as drawing 1 concerning the operation gestalt of this invention), and the brightness of this superposition portion may not become high further.

[0004]

[Problem(s) to be Solved by the Invention] however, in a Prior art which was mentioned above Though it is difficult to arrange a gobo so that only the amount of said may shade the quantity of light of two or more image display equipments to pile [each other] up, and it adjusts at once at the time of manufacture etc. and being arranged at it When it moved from multi-display equipment or image display equipment was removed at the time of subsequent lamp exchange, physical relationship with a gobo had to be adjusted again and the technical problem that this adjustment took time had arisen.

[0005] Moreover, when a picture is projected, respectively so that each optical axis of two or more projectors 1 and 2 may become perpendicular to the principal plane of a screen 10 as shown in drawing 14 , the light which reaches the superposition section (superposition field) located in the verge of the partial picture by each projectors 1 and 2 will differ in directivity by the thing from a projector 1, and the thing from a projector 2.

[0006] When such a light is diffused in the diffusing surface of the above-mentioned screen 10 (see the diffused light of A in drawing 14 , and the diffused light in the B point), the diffused light Since it is spread as the biggest quantity of light in the same direction as an incident light, and the quantity of light diffuses as it declines as an angle separates from incidence Although there is no brightness, for the observer from a transverse plane, with a bird clapper discontinuously unnaturally in the superposition section in the case of the observer from slant like illustration, for example The quantity of light from a projector 2 becomes small to the quantity of light from a projector 1, and it will be observed as unnatural

discontinuity.

[0007] this invention is made in view of the above-mentioned situation, and it aims at offering the adjustment method of the multi-display equipment which can observe the picture constituted by two or more partial pictures as almost uniform brightness also in a superposition field, a multi-display system, and multi-display equipment.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the multi-display equipment by the 1st invention It is multi-display equipment made as [constitute / one picture / as a whole / by arranging laying the partial picture which was equipped with two or more picture projection meanses, and was projected on the screen by this picture projection means with a superposition field on top of the partial picture which adjoins in the verge]. It is what adjusts the quantity of light of the flux of light projected towards this superposition field in order to carry out abbreviation coincidence of the brightness of the above-mentioned superposition field with the brightness of the partial picture except this superposition field. It has the quantity of light regulation means made as [carry out / the variation rate of the quantity of light region of accommodation of other verge to one verge of the partial picture projected].

[0009] Moreover, the multi-display equipment by the 2nd invention In the multi-display equipment by the 1st above-mentioned invention the above-mentioned quantity of light regulation means Being able to carry out the variation rate of the quantity of light region of accommodation of two or more verge concerning the partial picture projected, the direction of these variation rates includes the two or more directions of [of the 2-ways and hands of cut within the field which intersects the flux of light projected from the above-mentioned picture projection means which became independent mutually].

[0010] Furthermore, the multi-display equipment by the 3rd invention In the multi-display equipment by the 1st above-mentioned invention, at least one of two or more above-mentioned picture projection meanses is arranged so that the picture projection direction may intersect the normal stood to the principal plane of a screen. The above-mentioned quantity of light regulation means carries out the variation rate of the quantity of light region of accommodation so that the quantity of light of the portion used as a difference with the partial picture at the time of projecting in the direction of a normal which stood this picture projection means of the partial pictures projected by this picture projection means to the principal plane of a screen may be adjusted.

[0011] The multi-display equipment by the 4th invention comes to have the configuration section for carrying out abbreviation coincidence of the brightness of the superposition field which the partial picture on which the above-mentioned quantity of light regulation means is projected by three or more picture projection meanses comes to pile up with the brightness of the partial picture except this superposition field in the multi-display equipment by the 1st above-mentioned invention.

[0012] In the multi-display equipment by the 1st above-mentioned invention, the multi-display equipment by the 5th invention is constituted so that it may come to have the gobo with which the above-mentioned quantity of light regulation means shades a part of flux of light [at least] projected towards a superposition field one or more and the gobo of at least 1 may become movable.

[0013] In multi-display equipment according [the multi-display equipment by the 6th invention] to the 1st above-mentioned invention, the above-mentioned quantity of light regulation means is constituted so that it may come to have the dimming filter as for which permeability or a reflection factor becomes continuous highly stair-like one or more and the dimming filter of at least 1 may become movable from the verge toward a center.

[0014] The multi-display equipment by the 7th invention It comes to have the incident-light study system which projects the picture on the display device illuminated by a lighting means to illuminate the display device as which the above-mentioned picture projection means displays a picture, and this display device in the multi-display equipment by the 1st above-mentioned invention, and this lighting means. the above-mentioned quantity of light regulation means It is arranged on the optical path from the above-mentioned lighting means to an incident-light study system, and comes to have the liquid crystal

panel for quantity of light regulation which performs at least a switch of shading of the flux of light projected on the above-mentioned superposition field, and light transmission, or one side of change of permeability.

[0015] The multi-display equipment by invention of the octavus is further equipped with a fixed means to fix in one to maintain the above-mentioned quantity of light regulation means and the above-mentioned picture projection means in a position relation, in the multi-display equipment by the 1st above-mentioned invention.

[0016] The multi-display system by the 9th invention Multi-display equipment given in any 1 of the invention of the 1st invention to the octavus, An image pck-up means to picturize the picture projected on the screen of this multi-display equipment, A brightness detection means to extract a luminance signal from the image pck-up signal of this image pck-up means, and to detect the size and brightness of the above-mentioned superposition field, An amount operation means of gaps to which the variation rate of the above-mentioned quantity of light region of accommodation should be further carried out by the above-mentioned quantity of light regulation means based on the output of this brightness detection means to shift and to calculate an amount, It has the control means controlled to carry out the variation rate of the to shift and according to above-mentioned quantity of light regulation means based on amount quantity of light region of accommodation calculated by this amount operation means of gaps.

[0017] The adjustment method of the multi-display equipment by the 10th invention The step which picturizes the picture which is the adjustment method of multi-display equipment given in any 1 the 8th invention from the 1st invention, and was projected on the screen of the above-mentioned multi-display equipment, and outputs an image pck-up signal, The step which extracts a luminance signal from the above-mentioned image pck-up signal, and detects the size and brightness of the above-mentioned superposition field, The step to which the variation rate of the quantity of light region of accommodation should be further carried out based on the information on the size and brightness of the detected superposition field by the quantity of light regulation means of the above-mentioned multi-display equipment and which shifts and calculates an amount, It has the step controlled to carry out the variation rate of the quantity of light region of accommodation by the above-mentioned quantity of light regulation means based on the above-mentioned amount of gaps.

[0018]

[Embodiments of the Invention] Hereafter, the form of operation of this invention is explained with reference to a drawing. Drawing 4 shows the 1st operation form of this invention from drawing 1 , and drawing 1 is the perspective diagram showing the outline of the composition of multi-display equipment.

[0019] This multi-display equipment is installing the nine picture projection means slack projectors 1-9 so that it may become the array of 3x3, and the penetrated type screen 10 is arranged in the projection position of these projectors 1-9. At this time, in the ****, the projection range by each projectors 1-9 is projected so that it may have the portion on which it is superimposed with the projection range by the adjoining projector.

[0020] The projection range by the projectors 1-3 at this time is taken out, and drawing 2 shows the situation of the superposition section (superposition field) on which it is superimposed. Drawing 2 is drawing in which laying with each projection range of three projectors arranged in parallel by the longitudinal direction, and showing the situation of the section.

[0021] In a longitudinal direction, the projection range of a projector 1 was piled up with the projection range of a projector 2, and overlaps in part in the section, and the projection range of a projector 3 overlaps the projection range of a projector 2 in part in the superposition section of an opposite side.

[0022] In the multi-display equipment of such a projection range, since the brightness of the superposition section becomes twice [about] portions other than the superposition section in not carrying out any work, drawing 3 shows signs that it was made to dim the light of each projector which prepared and piles up a gobo and is projected on the section.

[0023] Drawing 3 is the plan showing signs that the light on which it is projected by the superposition section is dimmed with a gobo.

[0024] When projectors 1-3 are arranged like illustration, as mentioned above, it lays on top of one of the projection range side with a projector 1, and a projector 2 has the section, lays on top of an another side side with a projector 3, and has the section.

[0025] Then, a gobo is arranged like illustration on the passage path of the flux of light which reaches this superposition section.

[0026] That is, the quantity of light regulation means slack gobo 11 to a projector 1 is constituted as what has arranged shading section 11a so that it may be located on the passage path of the flux of light which reaches the superposition section with the projection range of a projector 2.

[0027] Moreover, the quantity of light regulation means slack gobo 12 to a projector 2 is constituted as what has arranged shading section 12b so that it may be located on the passage path of the flux of light which arranges shading section 12a so that it may be located on the passage path of the flux of light which reaches the superposition section with the projection range of a projector 1, and reaches the superposition section with the projection range of a projector 3.

[0028] Furthermore, the quantity of light regulation means slack gobo 13 to a projector 3 is constituted as what has arranged shading section 13a so that it may be located on the passage path of the flux of light which reaches the superposition section with the projection range of a projector 2.

[0029] Since such gobos 11, 12, and 13 are arranged on the optical path between the above-mentioned projectors 1, 2, and 3 and a screen 10 and this position serves as a non-focal plane, the effect of shading by the shading section shows up on the screen 10 arranged in the focal plane as a gently-sloping shading effect with gradation.

[0030] Namely, if the relative brightness of the non-superposition section of a projector 1 and a projector 2 is set to 1, for example In the superposition section of these projectors 1 and a projector 2, in the portion close to the non-superposition section of a projector 1 The brightness of the picture projected by the projector 1 becomes a thing near 1, the brightness of the picture projected by the projector 2 becomes a thing near 0, and these will superimpose it, and it will be displayed as a picture of about 1 brightness.

[0031] In the portion which similarly approaches the non-superposition section of a projector 2 in the superposition section of a projector 1 and a projector 2, the brightness of the picture projected by the projector 1 becomes a thing near 0, and the brightness of the picture projected by the projector 2 becomes a thing near 1, these will be overlapped, and it will be displayed as a picture of about 1 brightness.

[0032] And in the superposition section of a projector 1 and a projector 2, in the portion which serves as the mid-position mostly, the brightness of the picture projected by the projector 1 becomes a thing near 0.5, the brightness of the picture projected by the projector 2 becomes a thing near 0.5, and too, these will superimpose it and it will be displayed as a picture of about 1 brightness.

[0033] In this way, in the superposition section, since the images by the adjoining projector are connected smoothly and the brightness turns into the almost same brightness as the non-superposition section, it becomes possible to observe a smooth picture without discontinuity.

[0034] Since the above-mentioned superposition section is decided by an arrangement interval, an arrangement angle, etc. of projectors at this time, a gobo must determine the position of the shading section according to arrangement of such a projector. The gobo of this operation form has composition which makes adjustable a part of the shading section so that arrangement of such the shading section can be positioned correctly.

[0035] The composition of the gobo constituted so that it might become adjustable [this] is explained with reference to drawing 4 . Drawing 4 is the front view showing the composition of the gobo for shading the four-side edge of the projection range which makes the shape of a rectangle.

[0036] The composition of the gobo shown in this drawing 4 corresponds to the projector 5 in the example of arrangement of a projector as shown in above-mentioned drawing 1 .

[0037] The projector 5 is constituted for the picture of a projector 8, and the gobo corresponding to [since it will have the superposition section with the picture of a projector 4 on the picture of a projector 6, and left-hand side on the right-hand side, respectively] this projector 5 by the bottom with the picture

of a projector 2, and the down side so that all of four **** of a picture which make the shape of a rectangle can be shaded.

[0038] That is, it is arranged so that 15d of wrap shading sections may become movable with an exception object about wrap shading section 15c and right-hand side ****, respectively in top **** which wrap shading section 15b is constituted so that it may unify and may become a L character configuration, on the other hand becomes by rectangular plate-like part material in wrap shading section 15a and bottom **** for example, about left-hand side **** of the projection range 14 by the projector 5.

[0039] Namely, shading section 15c is prepared so that it may become movable to the vertical direction, and it can change now an interval with shading section 15b by this.

[0040] Moreover, 15d of shading sections is prepared so that it may become movable to a longitudinal direction, and they can change now an interval with shading section 15a by this.

[0041] In addition, although only the shading section of one [of 2 sets of **** which counter.] **** of each class was made movable, all the shading sections of a four-side edge are not cared about with the example shown in this drawing 4 as movement being possible.

[0042] Moreover, it is same to have the composition of having the required shading section, according to a gobo as showed the gobo corresponding to the projector from which the superposition section becomes three or less ****, i.e., the gobo corresponding to the projectors 1, 2, 3, 4, 6, 7, 8, and 9 in the example of drawing 1, to this drawing 4.

[0043] Furthermore, you may make it constitute from a dimming filter to which permeability becomes stair-like and high toward a dimming filter as for which permeability becomes gradually high toward not only this but **** to a center although constituted as what shades light for a gobo completely in ****, or **** to a center.

[0044] According to such 1st operation form, by preparing possible [movement of a gobo], it is enabled to adjust the superposition width of face of the superposition section simply, and to carry out intensity control, and the brightness of the whole screen can be easily equalized in short adjustment time. In this way, also in the superposition section, brightness serves as multi-display equipment which can display the quality picture connected smoothly.

[0045] Drawing 8 shows the 2nd operation form of this invention from drawing 5, and drawing 5 is the plan showing the composition for improving the directivity of the incident light to a screen. In this 2nd operation form, the sign same about the same portion as the 1st above-mentioned operation form is attached, explanation is omitted, and only a mainly different point is explained.

[0046] As mentioned above, when it observes from across with this directivity in the superposition section of the picture projected from the projector arranged so that the quantity of light diffused on a screen 10 might have the directivity for which it depended in the direction of an incident light and an optical axis might become parallel, brightness may be observed discontinuously.

[0047] It is arrangement of a projector as the composition for improving such a technical problem shows to this drawing 5.

[0048] The projector 2 arranged in the center projects a picture in the almost perpendicular direction to the principal plane of a screen 10 like illustration.

[0049] Near the lens which projects the picture of this projector 2, reflecting mirrors 21 and 22 are arranged and the thing for one reflecting mirror 21 reflecting the picture projected from a projector 1 and the reflecting mirror 22 of another side have become a thing for reflecting the picture projected from a projector 3.

[0050] That is, after being reflected by the reflecting mirror 21, the picture projected by the projector 1 is projected so that it may have the superposition section of a picture and the predetermined range projected from the above-mentioned projector 2 on a screen 10.

[0051] Similarly, after being reflected by the reflecting mirror 22, the picture projected by the projector 3 is projected so that it may have the superposition section of a picture and the predetermined range projected from the above-mentioned projector 2 on a screen 10.

[0052] Thus, by arranging projectors 1 and 3 and reflecting mirrors 21 and 22 In the superposition section, incidence of the light projected from a projector 1 and the light projected from a projector 2 is mostly carried out to a screen 10 in the same direction. Since incidence also of the light projected from a projector 3 and the light projected from a projector 2 will be mostly carried out to a screen 10 in the same direction Not only when big discontinuity does not arise from each superposition section in the quantity of light directivity of the diffused light by which outgoing radiation is carried out and it observes from a transverse plane, but when it observes from across, brightness changes and does not look discontinuous.

[0053] Drawing 6 is drawing showing the appearance of the projection screen to the screen by the projector arranged as shown in above-mentioned drawing 5 .

[0054] If a rectangular picture is projected on a screen 10 by the projectors 1, 2, and 3 of arrangement as shown in above-mentioned drawing 5 , although the picture of a projector 2 will serve as a projection screen with a rectangle, since the picture of a projector 1 and the picture of a projector 3 will be projected in the direction of slant, they will turn into an isosceles-trapezoid-like image like illustration.

[0055] Then, it is shading using a gobo as shown in drawing 7 . Drawing 7 is the front view showing the composition of the gobo which covers the flux of light of the projector projected from the direction which crossed diagonally to the screen so that it may be projected as a rectangle-like picture.

[0056] As shown in drawing 7 , 1 set of shading sections 24a and 24d which counter are for shading **** of the perpendicular direction of the projection range 23 by the projector 1. The outside of the screen where one shading section 24a of these is compounded, i.e., the projection screen of a projector 2, is for shading an opposite side, and since it lays on top of this **** side and there is no section, you may not shade. 24d of shading sections of another side is for shading the flux of light which reaches the superposition section with the projection screen of a projector 2.

[0057] Moreover, 1 set of other shading sections 24b and 24c which counter are for shading **** of the abbreviation horizontal direction of the projection range 23 by the projector 1, one shading section 24b shades a lower side side, and shading section 24c of another side shades a surface side.

[0058] At this time, centering control is possible for these shading sections 24b and 24c so that it may be constituted so that the displacement to a hand of cut may be attained, and it may become a thing as the projection screen after shading shows to drawing 8 .

[0059] Drawing 8 is drawing showing the situation when shading the projection screen of above-mentioned drawing 6 with a gobo as shown in above-mentioned drawing 7 .

[0060] Moreover, after the gobo which becomes in these shading sections 24a, 24b, 24c, and 24d is arranged into the intermediate optical path between a projector 1 and a screen 10 and passes this gobo, in consideration of the flux of light spreading further towards a screen 10, the interval of shading section 24b and shading section 24c has the narrow left-hand side of drawing 7 , and it is adjusted so that right-hand side may become large. When the range projected reaches a screen 10 by this, without being shaded, it becomes rectangle-like as shown in above-mentioned drawing 8 .

[0061] At this time, of course, the picture displayed on the liquid crystal display panel in a projector etc. is changed so that the projection picture of the range which is shown in this drawing 8 and which is not shaded may turn into a division picture by two or more projectors. Moreover, since it is reflected by reflecting mirrors 21 and 22, the picture by the projector 1 or the projector 3 cannot be overemphasized by that the picture displayed on the liquid crystal display panel in a projector etc. is reversed.

[0062] In addition, it is also possible to prepare the mask to which the mask or reflection factor which shades **** is changed on this reflecting mirror with the composition using a reflecting mirror, as mentioned above. In changing the reflection factor of a mask, it does not matter even if you may make it the reflection factor which goes in the center from **** become high continuously or it makes it become high stair-like.

[0063] Moreover, if a reflecting mirror which was mentioned above is constituted so that it may become a rotatable, a superposition position can also be easily adjusted by adjusting the angle of this reflecting mirror.

[0064] the quantity of light of the light diffused with a screen while doing so the almost same effect as the

1st operation form mentioned above according to such 2nd operation form can mitigate the discontinuity of the brightness resulting from depending in the direction to diffuse, and becomes possible [observing the picture which is the brightness which continued smoothly even from across]

[0065] Drawing 9 and drawing 10 show the 3rd operation form of this invention, and when the projection screen according [drawing 9] to four projectors laps in the corner of ****, the front view and drawing 10 which show the composition of the gobo used effectively are drawing showing the appearance of the projection screen by four projectors.

[0066] In this 3rd operation form, the sign same about the same portion as the above-mentioned 1st and 2nd operation form is attached, explanation is omitted, and only a mainly different point is explained.

[0067] When arranging a projector to a plane vertically and horizontally, the portion with which the projection screen by two or more projectors laps will arise. When considering the case of four projectors the projection screen according [the projection screen according / the projection screen according / the projection screen by the projector 1 / to a projector 2 / to a projector 3] to a projector 4 to the lower left is located in the upper left at the upper right at the lower right, respectively as shown, for example in drawing 10 since it is easy, the one superposition section according [the superposition section by two projectors] to four places and four projectors arises.

[0068] Namely, between the projection screen of a projector 1, and the projection screens of a projector 2, Between the projection screen of between the projection screen of a projector 1, and the projection screens of a projector 3, and a projector 2, and the projection screens of a projector 4, While the superposition section of two pictures arises between the projection screen of a projector 3, and the projection screen of a projector 4, the superposition section of four pictures arises into the portion to which each corner of four more projection pictures piles up and is joined.

[0069] Since brightness may become high rather than the portion of others [section / superposition / of these four pictures] at this time, drawing 9 shows the composition of the gobo for making it of the same grade as the brightness of other portions.

[0070] While being formed so that this quantity of light regulation means slack gobo 26 may correspond to a projector 1, it may be formed in the shape of abbreviation for L characters and the superposition section with a projector 3 and the superposition section with a projector 2 may be shaded Abbreviation 3 square-shape-like configuration section slack shading part 26a is prepared in the corner which makes the shape of the L character, and it is made to dim further the light which reaches the superposition section of four pictures.

[0071] By preparing such shading part 26a, the picture of almost uniform brightness can be acquired on the whole screen as shown in drawing 10 .

[0072] while doing so the almost same effect as the 1st and 2nd operation gestalt mentioned above according to such 3rd operation gestalt, the picture from which it adjusts appropriately that the brightness of the superposition section by three or more projectors becomes high too much, and the whole screen serves as almost uniform brightness in it is observed -- things become possible

[0073] Drawing 11 is the plane-cross-section view in which showing the 4th operation gestalt of this invention, and showing the composition which unifies a projector and a gobo and held the position relation. In this 4th operation gestalt, the sign same about the same portion as the 1st to 3rd above-mentioned operation gestalt is attached, explanation is omitted, and only a mainly different point is explained.

[0074] A projector has a penetrated type liquid crystal display panel for image display inside, and illuminates this penetrated type liquid crystal display panel by lighting meanses, such as a lamp, from a tooth-back side. In the projector of such composition, the brightness of a lamp falls by prolonged use, or there is a case where a lamp stops lighting up and it will exchange.

[0075] Although a projector will be removed from multi-display equipment and an internal lamp will be exchanged at this time, even if it attaches a projector again after exchange, time and effort becomes this thing for the physical relationship of a projector and a gobo to change delicately, and for readjustment be needed, and do lamp exchange work.

[0076] Then, by unifying a projector and a gobo using a case, the composition shown in this drawing 11 is constituted so that physical relationship may not change at the time of lamp exchange etc.

[0077] That is, the projector 1, a gobo 11 and a projector 2, a gobo 12 and a projector 3, and the gobo 13 are being fixed so that mutual physical relationship may become fixed through the fixed means slack case 16, respectively.

[0078] And it is removed by the gobo and one which are being fixed through the case 16 in case a projector is removed from multi-display equipment.

[0079] In addition, although each projector was united with the gobo corresponding to this projector, you may make it fix all projectors to the same case with all gobos here so that the physical relationship of projectors etc. may become fixed further.

[0080] while doing so the almost same effect as the 1st to 3rd operation gestalt mentioned above according to such 4th operation gestalt, the adjustment time which is needed in the cases, such as lamp exchange and other repair, is shortened sharply -- things become possible

[0081] Drawing 12 is drawing in which showing the 5th operation gestalt of this invention, and showing the composition which forms the liquid crystal panel for quantity of light regulation in the interior of a projector, and was made to shade the verge. In this 5th operation gestalt, the sign same about the same portion as the 1st to 4th above-mentioned operation gestalt is attached, explanation is omitted, and only a mainly different point is explained.

[0082] Although the gobo was prepared between the projector and the screen in ****, it is possible not only this but to arrange in the interior of a projector.

[0083] Namely, the picture projection means slack projector 31 The display device slack transparency type liquid crystal display panel 32 which displays a picture, and the lighting means slack lamp 37 for illuminating this penetrated type liquid crystal display panel 32, It has the incident-light study system slack lens 34 which projects the picture displayed by the above-mentioned penetrated type liquid crystal display panel 32, and is constituted. on the optical path between the above-mentioned lamp 37 and a lens 34 in limitation On the optical path between the above-mentioned penetrated type liquid crystal display panel 32 and a lens 34, the liquid crystal panel 33 for quantity of light regulation means slack quantity of light regulation for shading or dimming the flux of light emitted from the verge of the picture displayed by this penetrated type liquid crystal display panel 32 is arranged.

[0084] This liquid crystal panel 33 for quantity of light regulation has transparency section 33a which makes light penetrate almost as it is, and shading section 33b which adjusts the amount of transmitted lights by the side of the circumference of this transparency section 33a, is constituted, and is driven by the driver 35.

[0085] The data which the shade section setting means 36 sets up the shading range of the above-mentioned shading section 33b, the shade at the time of shading, etc., and were set up are outputted to the above-mentioned driver 35, and control of the liquid crystal panel 33 for quantity of light regulation is performed by this driver 35.

[0086] while doing so the almost same effect as the 1st to 4th operation form mentioned above according to such 5th operation form, by arranging in a projector the liquid crystal panel for quantity of light regulation which has a shading function, physical relationship with a penetrated type liquid crystal display panel does not change at the time of lamp exchange etc., and adjustment time is shortened -- things become possible And it also becomes possible for it to become unnecessary to perform control mechanical since it can adjust only by electric control, and for a mechanism to become easy, and to miniaturize equipment.

[0087] Drawing 13 is the block diagram in which showing the 6th operation form of this invention, and showing the multi-display structure of a system for carrying out the brilliance control of the multi-display equipment. In this 6th operation form, the sign same about the same portion as the 1st to 5th above-mentioned operation form is attached, explanation is omitted, and only a mainly different point is explained.

[0088] multi-display equipment which was mentioned above -- the time of shipment -- or it is necessary

to carry out positioning, such as the above-mentioned gobo, so that the brightness of the above-mentioned superposition section may become uniform at the time of lamp exchange etc. Then, this drawing 13 shows the composition for performing such a brilliance control.

[0089] Image formation of the partial picture each projected by projectors 1, 2, and 3 is carried out to a screen 10 respectively through gobos 11, 12, and 13.

[0090] The whole picture on this screen 10 is picturized by image pick-up means, such as a digital camera 46, the brightness detection means slack brightness detecting element 45 extracts a luminance signal from the picture signal, and the lap width of face and the position of the superposition section are detected based on this luminance signal.

[0091] The amount operation part 43 of amount operation means slack gaps of gaps is computed referring to the data memorized by the frame memory 44 in the amount of gaps which shows how many the above-mentioned gobos 11, 12, and 13 should be moved for the brightness of the uneven portion to an amendment sake based on the output of the above-mentioned brightness detecting element 45, when the brightness of the whole screen is not uniform.

[0092] It shifts and the motor driver 41 is driven based on an amount, and when [which drive and justify gobos 11, 12, and 13] computed by this amount operation part 43 of gaps, the control-means slack control section 42 adjusts brightness, and equalizes it.

[0093] In addition, when a quantity of light regulation means becomes with the liquid crystal panel for quantity of light regulation as shown in the operation gestalt of the above 5th, a control section 42 makes it control electrically through a driver.

[0094] while doing so the almost same effect as the 1st to 5th operation gestalt mentioned above according to such 6th operation gestalt -- the time of shipment -- or when performing a brilliance control in the time of lamp exchange or other repair etc., it becomes possible only by picturizing a screen with a digital camera etc. to adjust automatically, and it becomes possible to shorten working hours

[0095] In addition, as for this invention, it is needless to say for various deformation and application to be possible within limits which are not limited to the operation gestalt mentioned above and do not deviate from the main point of invention.

[0096]

[Effect of the Invention] Since the variation rate of the quantity of light region of accommodation of other verge to one verge of the partial picture projected by the picture projection means can be carried out according to the multi-display equipment of this invention by the claim 1 as explained above, it becomes possible to observe the picture constituted by two or more partial pictures as almost uniform brightness also in a superposition field.

[0097] Moreover, since according to the multi-display equipment of this invention by the claim 2 a variation rate can be carried out to a desired direction and a desired hand of cut while doing so the same effect as invention according to claim 1, optimal quantity of light regulation can be performed finely.

[0098] furthermore, while doing so the same effect as invention according to claim 1 according to the multi-display equipment of this invention by the claim 3, it becomes possible from a different picture projection means to make mostly into the same direction the direction of the light projected on a superposition field, and the brightness which is a time of observing a screen from across can be considered as continuation

[0099] according to the multi-display equipment of this invention by the claim 4, while doing so the same effect as invention according to claim 1, abbreviation coincidence of the brightness of the superposition field which the partial picture projected by three or more picture projection means comes to pile up by the configuration section can be carried out with the brightness of the partial picture except this superposition field, and it becomes possible to observe the picture which is brightness uniform as a whole

[0100] According to the multi-display equipment of this invention by the claim 5, the same effect as invention according to claim 1 can be done so by using a gobo.

[0101] According to the multi-display equipment of this invention by the claim 6, while doing so the same effect as invention according to claim 1, a desired quantity of light regulation state can be acquired by

using a dimming filter.

[0102] while being able to acquire the quantity of light regulation state which is a request by arranging a quantity of light regulation means to come to have a liquid crystal panel for quantity of light regulation, on the optical path from a lighting means to an incident-light study system while doing so the same effect as invention according to claim 1 according to the multi-display equipment of this invention by the claim 7, it becomes possible to attain a miniaturization

[0103] Since according to the multi-display equipment of this invention by the claim 8 a quantity of light regulation means and a picture projection means are fixed in one by the fixed means and it is maintaining in the position relation while doing so the same effect as invention according to claim 1, it becomes possible to shorten the adjustment time at the time of maintenance or repair.

[0104] The picture which was projected on the screen according to the multi-display system of this invention by the claim 9 is picturized, the size and brightness of a superposition field are detected, the amount of gaps is calculated, and automatic tuning becomes possible in order to control to carry out the variation rate of the quantity of light region of accommodation by the quantity of light regulation means.

[0105] The picture which was projected on the screen according to the adjustment method of the multi-display equipment of this invention by the claim 10 is picturized, the size and brightness of a superposition field are detected, the amount of gaps is calculated, and automatic tuning becomes possible in order to control to carry out the variation rate of the quantity of light region of accommodation by the quantity of light regulation means.

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TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to the adjustment method of the multi-display equipment which constitutes one picture as a whole, a multi-display system, and multi-display equipment by arranging the adjustment method of multi-display equipment, a multi-display system, and multi-display equipment, and the partial picture projected by two or more picture projection meanses in more detail.

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PRIOR ART

[Description of the Prior Art] That as which various things are proposed from before, for example, the multi-display equipment which displays the picture of one sheet using the image display equipment which is two or more picture projection meanses was indicated to be by JP,5-103286,A, JP,3-53288,A, JP,9-211386,A, JP,6-169444,A, etc. is mentioned as an example.

[0003] The gobo which shades the edge of the projection range by the projector is arranged, and it is made to dim between image display equipment (projector) and a screen the quantity of light so that it may consist of such conventional multi-display equipment so that the knot portion of the pictures projected by two or more image display equipments may be overlapped mutually (references, such as drawing 1 concerning the operation gestalt of this invention), and the brightness of this superposition portion may not become high further.

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EFFECT OF THE INVENTION

[Effect of the Invention] Since the variation rate of the quantity of light region of accommodation of other **** to the one-side edge of the partial picture projected by the picture projection means can be carried out according to the multi-display equipment of this invention by the claim 1 as explained above, it becomes possible to observe the picture constituted by two or more partial pictures as almost uniform brightness also in a superposition field.

[0097] Moreover, since according to the multi-display equipment of this invention by the claim 2 a variation rate can be carried out to a desired direction and a desired hand of cut while doing so the same effect as invention according to claim 1, optimal quantity of light regulation can be performed finely.

[0098] furthermore, while doing so the same effect as invention according to claim 1 according to the multi-display equipment of this invention by the claim 3, it becomes possible from a different picture projection means to make mostly into the same direction the direction of the light projected on a superposition field, and the brightness which is a time of observing a screen from across can be considered as continuation

[0099] according to the multi-display equipment of this invention by the claim 4, while doing so the same effect as invention according to claim 1, abbreviation coincidence of the brightness of the superposition field which the partial picture projected by three or more picture projection means comes to pile up by the configuration section can be carried out with the brightness of the partial picture except this

superposition field, and it becomes possible to observe the picture which is brightness uniform as a whole

[0100] According to the multi-display equipment of this invention by the claim 5, the same effect as invention according to claim 1 can be done so by using a gobo.

[0101] According to the multi-display equipment of this invention by the claim 6, while doing so the same effect as invention according to claim 1, a desired quantity of light regulation state can be acquired by using a dimming filter.

[0102] while being able to acquire the quantity of light regulation state which is a request by arranging a quantity of light regulation means to come to have a liquid crystal panel for quantity of light regulation, on the optical path from a lighting means to an incident-light study system while doing so the same effect as invention according to claim 1 according to the multi-display equipment of this invention by the claim 7, it becomes possible to attain a miniaturization

[0103] Since according to the multi-display equipment of this invention by the claim 8 a quantity of light regulation means and a picture projection means are fixed in one by the fixed means and it is maintaining in the position relation while doing so the same effect as invention according to claim 1, it becomes possible to shorten the adjustment time at the time of maintenance or repair.

[0104] The picture which was projected on the screen according to the multi-display system of this invention by the claim 9 is picturized, the size and brightness of a superposition field are detected, the amount of gaps is calculated, and automatic tuning becomes possible in order to control to carry out the variation rate of the quantity of light region of accommodation by the quantity of light regulation means.

[0105] The picture which was projected on the screen according to the adjustment method of the

multi-display equipment of this invention by the claim 10 is picturized, the size and brightness of a superposition field are detected, the amount of gaps is calculated, and automatic tuning becomes possible in order to control to carry out the variation rate of the quantity of light region of accommodation by the quantity of light regulation means.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, in a Prior art which was mentioned above Though it is difficult to arrange a gobo so that only the amount of said may shade the quantity of light of two or more image display equipments to pile [each other] up, and it adjusts at once at the time of manufacture etc. and being arranged at it When it moved from multi-display equipment or image display equipment was removed at the time of subsequent lamp exchange, physical relationship with a gobo had to be adjusted again and the technical problem that this adjustment took time had arisen.

[0005] Moreover, when a picture is projected, respectively so that each optical axis of two or more projectors 1 and 2 may become perpendicular to the principal plane of a screen 10 as shown in drawing 14 , the light which reaches the superposition section (superposition field) located in the verge of the partial picture by each projectors 1 and 2 will differ in directivity by the thing from a projector 1, and the thing from a projector 2.

[0006] When such a light is diffused in the diffusing surface of the above-mentioned screen 10 (see the diffused light of A in drawing 14 , and the diffused light in the B point), the diffused light Since it is spread as the biggest quantity of light in the same direction as an incident light, and the quantity of light diffuses as it declines as an angle separates from incidence Although there is no brightness, for the observer from a transverse plane, with a bird clapper discontinuously unnaturally in the superposition section in the case of the observer from slant like illustration, for example The quantity of light from a projector 2 becomes small to the quantity of light from a projector 1, and it will be observed as unnatural discontinuity.

[0007] this invention is made in view of the above-mentioned situation, and it aims at offering the adjustment method of the multi-display equipment which can observe the picture constituted by two or more partial pictures as almost uniform brightness also in a superposition field, a multi-display system, and multi-display equipment.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the multi-display equipment by the 1st invention It is multi-display equipment made as [constitute / one picture / as a whole / by arranging laying the partial picture which was equipped with two or more picture projection meanses, and was projected on the screen by this picture projection means with a superposition field on top of the partial picture which adjoins in the verge]. It is what adjusts the quantity of light of the flux of light projected towards this superposition field in order to carry out abbreviation coincidence of the brightness of the above-mentioned superposition field with the brightness of the partial picture except this superposition field. It has the quantity of light regulation means made as [carry out / the variation rate of the quantity of light region of accommodation of other verge to one verge of the partial picture projected].

[0009] Moreover, the multi-display equipment by the 2nd invention In the multi-display equipment by the 1st above-mentioned invention the above-mentioned quantity of light regulation means Being able to carry out the variation rate of the quantity of light region of accommodation of two or more verge concerning the partial picture projected, the direction of these variation rates includes the two or more directions of [of the 2-ways and hands of cut within the field which intersects the flux of light projected from the above-mentioned picture projection means which became independent mutually].

[0010] Furthermore, the multi-display equipment by the 3rd invention In the multi-display equipment by the 1st above-mentioned invention, at least one of two or more above-mentioned picture projection meanses is arranged so that the picture projection direction may intersect the normal stood to the principal plane of a screen. The above-mentioned quantity of light regulation means carries out the variation rate of the quantity of light region of accommodation so that the quantity of light of the portion used as a difference with the partial picture at the time of projecting in the direction of a normal which stood this picture projection means of the partial pictures projected by this picture projection means to the principal plane of a screen may be adjusted.

[0011] The multi-display equipment by the 4th invention comes to have the configuration section for carrying out abbreviation coincidence of the brightness of the superposition field which the partial picture on which the above-mentioned quantity of light regulation means is projected by three or more picture projection meanses comes to pile up with the brightness of the partial picture except this superposition field in the multi-display equipment by the 1st above-mentioned invention.

[0012] In the multi-display equipment by the 1st above-mentioned invention, the multi-display equipment by the 5th invention is constituted so that it may come to have the gobo with which the above-mentioned quantity of light regulation means shades a part of flux of light [at least] projected towards a superposition field one or more and the gobo of at least 1 may become movable.

[0013] In multi-display equipment according [the multi-display equipment by the 6th invention] to the 1st above-mentioned invention, the above-mentioned quantity of light regulation means is constituted so that it may come to have the dimming filter as for which permeability or a reflection factor becomes continuous highly stair-like one or more and the dimming filter of at least 1 may become movable from

the verge toward a center.

[0014] The multi-display equipment by the 7th invention It comes to have the incident-light study system which projects the picture on the display device illuminated by a lighting means to illuminate the display device as which the above-mentioned picture projection means displays a picture, and this display device in the multi-display equipment by the 1st above-mentioned invention, and this lighting means. the above-mentioned quantity of light regulation means It is arranged on the optical path from the above-mentioned lighting means to an incident-light study system, and comes to have the liquid crystal panel for quantity of light regulation which performs at least a switch of shading of the flux of light projected on the above-mentioned superposition field, and light transmission, or one side of change of permeability.

[0015] The multi-display equipment by invention of the octavus is further equipped with a fixed means to fix in one to maintain the above-mentioned quantity of light regulation means and the above-mentioned picture projection means in a position relation, in the multi-display equipment by the 1st above-mentioned invention.

[0016] The multi-display system by the 9th invention Multi-display equipment given in any 1 of the invention of the 1st invention to the octavus, An image pck-up means to picturize the picture projected on the screen of this multi-display equipment, A brightness detection means to extract a luminance signal from the image pck-up signal of this image pck-up means, and to detect the size and brightness of the above-mentioned superposition field, An amount operation means of gaps to which the variation rate of the above-mentioned quantity of light region of accommodation should be further carried out by the above-mentioned quantity of light regulation means based on the output of this brightness detection means to shift and to calculate an amount, It has the control means controlled to carry out the variation rate of the to shift and according to above-mentioned quantity of light regulation means based on amount quantity of light region of accommodation calculated by this amount operation means of gaps.

[0017] The adjustment method of the multi-display equipment by the 10th invention The step which picturizes the picture which is the adjustment method of multi-display equipment given in any 1 the invention of the 1st invention to the octavus, and was projected on the screen of the above-mentioned multi-display equipment, and outputs an image pck-up signal, The step which extracts a luminance signal from the above-mentioned image pck-up signal, and detects the size and brightness of the above-mentioned superposition field, The step to which the variation rate of the quantity of light region of accommodation should be further carried out based on the information on the size and brightness of the detected superposition field by the quantity of light regulation means of the above-mentioned multi-display equipment and which shifts and calculates an amount, It has the step controlled to carry out the variation rate of the quantity of light region of accommodation by the above-mentioned quantity of light regulation means based on the above-mentioned amount of gaps.

[0018]

[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing. Drawing 4 shows the 1st operation gestalt of this invention from drawing 1 , and drawing 1 is the perspective diagram showing the outline of the composition of multi-display equipment.

[0019] This multi-display equipment is installing the nine picture projection means slack projectors 1-9 so that it may become the array of 3x3, and the penetrated type screen 10 is arranged in the projection position of these projectors 1-9. At this time, in the verge, the projection range by each projectors 1-9 is projected so that it may have the portion on which it is superimposed with the projection range by the adjoining projector.

[0020] The projection range by the projectors 1-3 at this time is taken out, and drawing 2 shows the situation of the superposition section (superposition field) on which it is superimposed. Drawing 2 is drawing in which laying with each projection range of three projectors arranged in parallel by the longitudinal direction, and showing the situation of the section.

[0021] In a longitudinal direction, the projection range of a projector 1 was piled up with the projection range of a projector 2, and overlaps in part in the section, and the projection range of a projector 3

overlaps the projection range of a projector 2 in part in the superposition section of an opposite side.

[0022] In the multi-display equipment of such a projection range, since the brightness of the superposition section becomes twice [about] portions other than the superposition section in not carrying out any work, drawing 3 shows signs that it was made to dim the light of each projector which prepared and piles up a gobo and is projected on the section.

[0023] Drawing 3 is the plan showing signs that the light on which it is projected by the superposition section is dimmed with a gobo.

[0024] When projectors 1-3 are arranged like illustration, as mentioned above, it lays on top of one of the projection range side with a projector 1, and a projector 2 has the section, lays on top of an another side side with a projector 3, and has the section.

[0025] Then, a gobo is arranged like illustration on the passage path of the flux of light which reaches this superposition section.

[0026] That is, the quantity of light regulation means slack gobo 11 to a projector 1 is constituted as what has arranged shading section 11a so that it may be located on the passage path of the flux of light which reaches the superposition section with the projection range of a projector 2.

[0027] Moreover, the quantity of light regulation means slack gobo 12 to a projector 2 is constituted as what has arranged shading section 12b so that it may be located on the passage path of the flux of light which arranges shading section 12a so that it may be located on the passage path of the flux of light which reaches the superposition section with the projection range of a projector 1, and reaches the superposition section with the projection range of a projector 3.

[0028] Furthermore, the quantity of light regulation means slack gobo 13 to a projector 3 is constituted as what has arranged shading section 13a so that it may be located on the passage path of the flux of light which reaches the superposition section with the projection range of a projector 2.

[0029] Since such gobos 11, 12, and 13 are arranged on the optical path between the above-mentioned projectors 1, 2, and 3 and a screen 10 and this position serves as a non-focal plane, the effect of shading by the shading section shows up on the screen 10 arranged in the focal plane as a gently-sloping shading effect with gradation.

[0030] Namely, if the relative brightness of the non-superposition section of a projector 1 and a projector 2 is set to 1, for example In the superposition section of these projectors 1 and a projector 2, in the portion close to the non-superposition section of a projector 1 The brightness of the picture projected by the projector 1 becomes a thing near 1, the brightness of the picture projected by the projector 2 becomes a thing near 0, and these will superimpose it, and it will be displayed as a picture of about 1 brightness.

[0031] In the portion which similarly approaches the non-superposition section of a projector 2 in the superposition section of a projector 1 and a projector 2, the brightness of the picture projected by the projector 1 becomes a thing near 0, and the brightness of the picture projected by the projector 2 becomes a thing near 1, these will be overlapped, and it will be displayed as a picture of about 1 brightness.

[0032] And in the superposition section of a projector 1 and a projector 2, in the portion which serves as the mid-position mostly, the brightness of the picture projected by the projector 1 becomes a thing near 0.5, the brightness of the picture projected by the projector 2 becomes a thing near 0.5, and too, these will superimpose it and it will be displayed as a picture of about 1 brightness.

[0033] In this way, in the superposition section, since the images by the adjoining projector are connected smoothly and the brightness turns into the almost same brightness as the non-superposition section, it becomes possible to observe a smooth picture without discontinuity.

[0034] Since the above-mentioned superposition section is decided by an arrangement interval, an arrangement angle, etc. of projectors at this time, a gobo must determine the position of the shading section according to arrangement of such a projector. The gobo of this operation gestalt has composition which makes adjustable a part of the shading section so that arrangement of such the shading section can be positioned correctly.

[0035] The composition of the gobo constituted so that it might become adjustable [this] is explained

with reference to drawing 4 . Drawing 4 is the front view showing the composition of the gobo for shading four verge of the projection range which makes the shape of a rectangle.

[0036] The composition of the gobo shown in this drawing 4 corresponds to the projector 5 in the example of arrangement of a projector as shown in above-mentioned drawing 1 .

[0037] The projector 5 is constituted for the picture of a projector 8, and the gobo corresponding to [since it will have the superposition section with the picture of a projector 4 on the picture of a projector 6, and left-hand side on the right-hand side, respectively] this projector 5 by the bottom with the picture of a projector 2, and the down side so that all of four verge of a picture which makes the shape of a rectangle can be shaded.

[0038] That is, it is arranged so that 15d of wrap shading sections may become movable with an exception object about wrap shading section 15c and the right-hand side verge, respectively in the top verge which wrap shading section 15b is constituted so that it may unify and may become a L character configuration, on the other hand becomes by rectangular plate-like part material in wrap shading section 15a and the bottom verge for example, about the left-hand side verge of the projection range 14 by the projector 5.

[0039] Namely, shading section 15c is prepared so that it may become movable to the vertical direction, and it can change now an interval with shading section 15b by this.

[0040] Moreover, 15d of shading sections is prepared so that it may become movable to a longitudinal direction, and they can change now an interval with shading section 15a by this.

[0041] In addition, although only the shading section of one [of 2 sets of verge which counters] verge of each class was made movable, all the shading sections of four verge are not cared about with the example shown in this drawing 4 as movement being possible.

[0042] Moreover, it is same to have the composition of having the required shading section, according to a gobo as showed the gobo corresponding to the projector from which the superposition section becomes three or less verge, i.e., the gobo corresponding to the projectors 1, 2, 3, 4, 6, 7, 8, and 9 in the example of drawing 1 , to this drawing 4 .

[0043] Furthermore, you may make it constitute from a dimming filter to which permeability becomes stair-like and high toward a dimming filter as for which permeability becomes gradually high toward not only this but **** to a center although constituted as what shades light for a gobo completely in ****, or **** to a center.

[0044] According to such 1st operation gestalt, by preparing possible [movement of a gobo], it is enabled to adjust the superposition width of face of the superposition section simply, and to carry out intensity control, and the brightness of the whole screen can be easily equalized in short adjustment time. In this way, also in the superposition section, brightness serves as multi-display equipment which can display the quality picture connected smoothly.

[0045] Drawing 8 shows the 2nd operation gestalt of this invention from drawing 5 , and drawing 5 is the plan showing the composition for improving the directivity of the incident light to a screen. In this 2nd operation gestalt, the sign same about the same portion as the 1st above-mentioned operation gestalt is attached, explanation is omitted, and only a mainly different point is explained.

[0046] As mentioned above, when it observes from across with this directivity in the superposition section of the picture projected from the projector arranged so that the quantity of light diffused on a screen 10 might have the directivity for which it depended in the direction of an incident light and an optical axis might become parallel, brightness may be observed discontinuously.

[0047] It is arrangement of a projector as the composition for improving such a technical problem shows to this drawing 5 .

[0048] The projector 2 arranged in the center projects a picture in the almost perpendicular direction to the principal plane of a screen 10 like illustration.

[0049] Near the lens which projects the picture of this projector 2, reflecting mirrors 21 and 22 are arranged and the thing for one reflecting mirror 21 reflecting the picture projected from a projector 1 and the reflecting mirror 22 of another side have become a thing for reflecting the picture projected from a

projector 3.

[0050] That is, after being reflected by the reflecting mirror 21, the picture projected by the projector 1 is projected so that it may have the superposition section of a picture and the predetermined range projected from the above-mentioned projector 2 on a screen 10.

[0051] Similarly, after being reflected by the reflecting mirror 22, the picture projected by the projector 3 is projected so that it may have the superposition section of a picture and the predetermined range projected from the above-mentioned projector 2 on a screen 10.

[0052] Thus, by arranging projectors 1 and 3 and reflecting mirrors 21 and 22 In the superposition section, incidence of the light projected from a projector 1 and the light projected from a projector 2 is mostly carried out to a screen 10 in the same direction. Since incidence also of the light projected from a projector 3 and the light projected from a projector 2 will be mostly carried out to a screen 10 in the same direction Not only when big discontinuity does not arise from each superposition section in the quantity of light directivity of the diffused light by which outgoing radiation is carried out and it observes from a transverse plane, but when it observes from across, brightness changes and does not look discontinuous.

[0053] Drawing 6 is drawing showing the appearance of the projection screen to the screen by the projector arranged as shown in above-mentioned drawing 5 .

[0054] If a rectangular picture is projected on a screen 10 by the projectors 1, 2, and 3 of arrangement as shown in above-mentioned drawing 5 , although the picture of a projector 2 will serve as a projection screen with a rectangle, since the picture of a projector 1 and the picture of a projector 3 will be projected in the direction of slant, they will turn into an isosceles-trapezoid-like image like illustration.

[0055] Then, it is shading using a gobo as shown in drawing 7 . Drawing 7 is the front view showing the composition of the gobo which covers the flux of light of the projector projected from the direction which crossed diagonally to the screen so that it may be projected as a rectangle-like picture.

[0056] As shown in drawing 7 , 1 set of shading sections 24a and 24d which counter are for shading the verge of the perpendicular direction of the projection range 23 by the projector 1. The outside of the screen where one shading section 24a of these is compounded, i.e., the projection screen of a projector 2, is for shading an opposite side, and since it lays on top of this verge side and there is no section, you may not shade. 24d of shading sections of another side is for shading the flux of light which reaches the superposition section with the projection screen of a projector 2.

[0057] Moreover, 1 set of other shading sections 24b and 24c which counter are for shading the verge of the abbreviation horizontal direction of the projection range 23 by the projector 1, one shading section 24b shades a lower side side, and shading section 24c of another side shades a surface side.

[0058] At this time, centering control is possible for these shading sections 24b and 24c so that it may be constituted so that the displacement to a hand of cut may be attained, and it may become a thing as the projection screen after shading shows to drawing 8 .

[0059] Drawing 8 is drawing showing the situation when shading the projection screen of above-mentioned drawing 6 with a gobo as shown in above-mentioned drawing 7 .

[0060] Moreover, after the gobo which becomes in these shading sections 24a, 24b, 24c, and 24d is arranged into the intermediate optical path between a projector 1 and a screen 10 and passes this gobo, in consideration of the flux of light spreading further towards a screen 10, the interval of shading section 24b and shading section 24c has the narrow left-hand side of drawing 7 , and it is adjusted so that right-hand side may become large. When the range projected reaches a screen 10 by this, without being shaded, it becomes rectangle-like as shown in above-mentioned drawing 8 .

[0061] At this time, of course, the picture displayed on the liquid crystal display panel in a projector etc. is changed so that the projection picture of the range which is shown in this drawing 8 and which is not shaded may turn into a division picture by two or more projectors. Moreover, since it is reflected by reflecting mirrors 21 and 22, the picture by the projector 1 or the projector 3 cannot be overemphasized by that the picture displayed on the liquid crystal display panel in a projector etc. is reversed.

[0062] In addition, it is also possible to prepare the mask to which the mask or reflection factor which shades the verge is changed on this reflecting mirror with the composition using a reflecting mirror, as

mentioned above. In changing the reflection factor of a mask, it does not matter even if you may make it the reflection factor which goes in the center from the verge become high continuously or it makes it become high stair-like.

[0063] Moreover, if a reflecting mirror which was mentioned above is constituted so that it may become a rotatable, a superposition position can also be easily adjusted by adjusting the angle of this reflecting mirror.

[0064] the quantity of light of the light diffused with a screen while doing so the almost same effect as the 1st operation gestalt mentioned above according to such 2nd operation gestalt can mitigate the discontinuity of the brightness resulting from depending in the direction to diffuse, and becomes possible [observing the picture which is the brightness which continued smoothly even from across]

[0065] Drawing 9 and drawing 10 show the 3rd operation gestalt of this invention, and when the projection screen according [drawing 9] to four projectors laps in the corner of the verge, the front view and drawing 10 which show the composition of the gobo used effectively are drawing showing the appearance of the projection screen by four projectors.

[0066] In this 3rd operation gestalt, the sign same about the same portion as the above-mentioned 1st and 2nd operation gestalt is attached, explanation is omitted, and only a mainly different point is explained.

[0067] When arranging a projector to a plane vertically and horizontally, the portion with which the projection screen by two or more projectors laps will arise. When considering the case of four projectors the projection screen according [the projection screen according / the projection screen according / the projection screen by the projector 1 / to a projector 2 / to a projector 3] to a projector 4 to the lower left is located in the upper left at the upper right at the lower right, respectively as shown, for example in drawing 10 since it is easy, the one superposition section according [the superposition section by two projectors] to four places and four projectors arises.

[0068] Namely, between the projection screen of a projector 1, and the projection screens of a projector 2, Between the projection screen of between the projection screen of a projector 1, and the projection screens of a projector 3, and a projector 2, and the projection screens of a projector 4, While the superposition section of two pictures arises between the projection screen of a projector 3, and the projection screen of a projector 4, the superposition section of four pictures arises into the portion to which each corner of four more projection pictures piles up and is joined.

[0069] Since brightness may become high rather than the portion of others [section / superposition / of these four pictures] at this time, drawing 9 shows the composition of the gobo for making it of the same grade as the brightness of other portions.

[0070] While being formed so that this quantity of light regulation means slack gobo 26 may correspond to a projector 1, it may be formed in the shape of abbreviation for L characters and the superposition section with a projector 3 and the superposition section with a projector 2 may be shaded Abbreviation 3 square-shape-like configuration section slack shading part 26a is prepared in the corner which makes the shape of the L character, and it is made to dim further the light which reaches the superposition section of four pictures.

[0071] By preparing such shading part 26a, the picture of almost uniform brightness can be acquired on the whole screen as shown in drawing 10.

[0072] while doing so the almost same effect as the 1st and 2nd operation gestalt mentioned above according to such 3rd operation gestalt, the picture from which it adjusts appropriately that the brightness of the superposition section by three or more projectors becomes high too much, and the whole screen serves as almost uniform brightness in it is observed -- things become possible

[0073] Drawing 11 is the plane-cross-section view in which showing the 4th operation gestalt of this invention, and showing the composition which unifies a projector and a gobo and held the position relation. In this 4th operation gestalt, the sign same about the same portion as the 1st to 3rd above-mentioned operation gestalt is attached, explanation is omitted, and only a mainly different point is explained.

[0074] A projector has a penetrated type liquid crystal display panel for image display inside, and

illuminates this penetrated type liquid crystal display panel by lighting meanses, such as a lamp, from a tooth-back side. In the projector of such composition, the brightness of a lamp falls by prolonged use, or there is a case where a lamp stops lighting up and it will exchange.

[0075] Although a projector will be removed from multi-display equipment and an internal lamp will be exchanged at this time, even if it attaches a projector again after exchange, time and effort becomes this thing for the physical relationship of a projector and a gobo to change delicately, and for readjustment be needed, and do lamp exchange work.

[0076] Then, by unifying a projector and a gobo using a case, the composition shown in this drawing 11 is constituted so that physical relationship may not change at the time of lamp exchange etc.

[0077] That is, the projector 1, a gobo 11 and a projector 2, a gobo 12 and a projector 3, and the gobo 13 are being fixed so that mutual physical relationship may become fixed through the fixed means slack case 16, respectively.

[0078] And it is removed by the gobo and one which are being fixed through the case 16 in case a projector is removed from multi-display equipment.

[0079] In addition, although each projector was united with the gobo corresponding to this projector, you may make it fix all projectors to the same case with all gobos here so that the physical relationship of projectors etc. may become fixed further.

[0080] while doing so the almost same effect as the 1st to 3rd operation gestalt mentioned above according to such 4th operation gestalt, the adjustment time which is needed in the cases, such as lamp exchange and other repair, is shortened sharply -- things become possible

[0081] Drawing 12 is drawing in which showing the 5th operation gestalt of this invention, and showing the composition which forms the liquid crystal panel for quantity of light regulation in the interior of a projector, and was made to shade the verge. In this 5th operation gestalt, the sign same about the same portion as the 1st to 4th above-mentioned operation gestalt is attached, explanation is omitted, and only a mainly different point is explained.

[0082] Although the gobo was prepared between the projector and the screen in ****, it is possible not only this but to arrange in the interior of a projector.

[0083] Namely, the picture projection means slack projector 31 The display device slack transparency type liquid crystal display panel 32 which displays a picture, and the lighting means slack lamp 37 for illuminating this penetrated type liquid crystal display panel 32, It has the incident-light study system slack lens 34 which projects the picture displayed by the above-mentioned penetrated type liquid crystal display panel 32, and is constituted. on the optical path between the above-mentioned lamp 37 and a lens 34 in limitation On the optical path between the above-mentioned penetrated type liquid crystal display panel 32 and a lens 34, the liquid crystal panel 33 for quantity of light regulation means slack quantity of light regulation for shading or dimming the flux of light emitted from the verge of the picture displayed by this penetrated type liquid crystal display panel 32 is arranged.

[0084] This liquid crystal panel 33 for quantity of light regulation has transparency section 33a which makes light penetrate almost as it is, and shading section 33b which adjusts the amount of transmitted lights by the side of the circumference of this transparency section 33a, is constituted, and is driven by the driver 35.

[0085] The data which the shade section setting means 36 sets up the shading range of the above-mentioned shading section 33b, the shade at the time of shading, etc., and were set up are outputted to the above-mentioned driver 35, and control of the liquid crystal panel 33 for quantity of light regulation is performed by this driver 35.

[0086] while doing so the almost same effect as the 1st to 4th operation gestalt mentioned above according to such 5th operation gestalt, by arranging in a projector the liquid crystal panel for quantity of light regulation which has a shading function, physical relationship with a penetrated type liquid crystal display panel does not change at the time of lamp exchange etc., and adjustment time is shortened -- things become possible And it also becomes possible for it to become unnecessary to perform control mechanical since it can adjust only by electric control, and for a mechanism to become easy, and to

miniaturize equipment.

[0087] Drawing 13 is the block diagram in which showing the 6th operation gestalt of this invention, and showing the multi-display structure of a system for carrying out the brilliance control of the multi-display equipment. In this 6th operation gestalt, the sign same about the same portion as the 1st to 5th above-mentioned operation gestalt is attached, explanation is omitted, and only a mainly different point is explained.

[0088] multi-display equipment which was mentioned above -- the time of shipment -- or it is necessary to carry out positioning, such as the above-mentioned gobo, so that the brightness of the above-mentioned superposition section may become uniform at the time of lamp exchange etc. Then, this drawing 13 shows the composition for performing such a brilliance control.

[0089] Image formation of the partial picture each projected by projectors 1, 2, and 3 is carried out to a screen 10 respectively through gobos 11, 12, and 13.

[0090] The whole picture on this screen 10 is picturized by image pck-up meanses, such as a digital camera 46, the brightness detection means slack brightness detecting element 45 extracts a luminance signal from the picture signal, and the lap width of face and the position of the superposition section are detected based on this luminance signal.

[0091] The amount operation part 43 of amount operation means slack gaps of gaps is computed referring to the data memorized by the frame memory 44 in the amount of gaps which shows how many the above-mentioned gobos 11, 12, and 13 should be moved for the brightness of the uneven portion to an amendment sake based on the output of the above-mentioned brightness detecting element 45, when the brightness of the whole screen is not uniform.

[0092] It shifts and the motor driver 41 is driven based on an amount, and when [which drive and justify gobos 11, 12, and 13] computed by this amount operation part 43 of gaps, the control-means slack control section 42 adjusts brightness, and equalizes it.

[0093] In addition, when a quantity of light regulation means becomes with the liquid crystal panel for quantity of light regulation as shown in the operation form of the above 5th, a control section 42 makes it control electrically through a driver.

[0094] while doing so the almost same effect as the 1st to 5th operation form mentioned above according to such 6th operation form -- the time of shipment -- or when performing a brilliance control in the time of lamp exchange or other repair etc., it becomes possible only by picturizing a screen with a digital camera etc. to adjust automatically, and it becomes possible to shorten working hours

[0095] In addition, as for this invention, it is needless to say for various deformation and application to be possible within limits which are not limited to the operation gestalt mentioned above and do not deviate from the main point of invention.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The perspective diagram showing the outline of the composition of the multi-display equipment in the 1st operation gestalt of this invention.

[Drawing 2] Drawing in which laying in the operation gestalt of the above 1st with each projection range of three projectors arranged in parallel by the longitudinal direction, and showing the situation of the section.

[Drawing 3] The plan showing signs that the light on which it is projected by the superposition section is dimmed with a gobo in the operation gestalt of the above 1st.

[Drawing 4] Front view showing the composition of the gobo for shading four verge of the projection range which makes the shape of a rectangle in the operation gestalt of the above 1st.

[Drawing 5] The plan showing the composition for improving the directivity of the incident light to a screen in the 2nd operation gestalt of this invention.

[Drawing 6] Drawing showing the appearance of the projection screen to the screen by the projector arranged in the operation gestalt of the above 2nd as shown in above-mentioned drawing 5.

[Drawing 7] Front view showing the composition of the gobo which covers the flux of light of the projector projected in the operation gestalt of the above 2nd from the direction which crossed diagonally to the screen so that it may be projected as a rectangle-like picture.

[Drawing 8] Drawing showing the situation when shading the projection screen of above-mentioned drawing 6 with a gobo as shown in above-mentioned drawing 7 in the operation gestalt of the above 2nd.

[Drawing 9] Front view showing the composition of the gobo used in the 3rd operation gestalt of this invention effectively [when the projection screen by four projectors laps in the corner of the verge].

[Drawing 10] Drawing showing the appearance of the projection screen by four projectors in the operation gestalt of the above 3rd.

[Drawing 11] The plane-cross-section view showing the composition which unifies a projector and a gobo and held the position relation in the 4th operation gestalt of this invention.

[Drawing 12] Drawing showing the composition which forms the liquid crystal panel for quantity of light regulation in the interior of a projector, and was made to shade the verge in the 5th operation gestalt of this invention.

[Drawing 13] The block diagram showing the multi-display structure of a system for carrying out the brilliance control of the multi-display equipment in the 6th operation gestalt of this invention.

[Drawing 14] Drawing showing signs that brightness differs when it sees from across, with quantity of light directivity when a projector is arranged in parallel and an image is projected on a screen in the former.

[Description of Notations]

1, 2, 3, 4, 5, 6, 7, 8, 9, 31 -- Projector (picture projection means)

10 -- Screen

11, 12, 13, 26 -- Gobo (quantity of light regulation means)

11a, 12a, 12b, 13a, 15a, 15b, 15c, 15d, 24a, 24b, 24c, 24d -- Shading section (some gobos)
16 -- Case (fixed means)
21 22 -- Reflecting mirror
26a -- Shading part (configuration section)
32 -- Penetrated type liquid crystal display panel (display device)
33 -- Liquid crystal panel for quantity of light regulation (quantity of light regulation means)
33a -- Transparency section
33b -- Shading section
34 -- Lens (incident-light study system)
35 -- Driver
36 -- Shade section setting means
37 -- Lamp (lighting means)
41 -- Motor driver
42 -- Control section (control means)
43 -- The amount operation part of gaps (the amount operation means of gaps)
44 -- Frame memory
45 -- Brightness detecting element (brightness detection means)
46 -- Digital camera (image pick-up means)

[Translation done.]

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44 -- Frame memory
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[Translation done.]

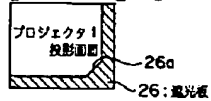
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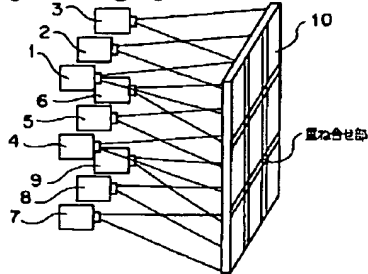
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DRAWINGS

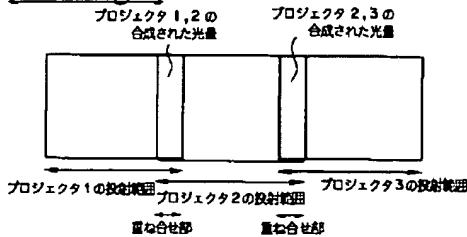
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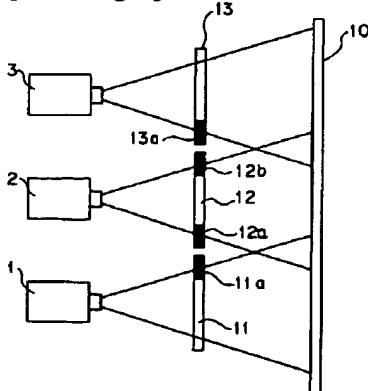
[Drawing 1]



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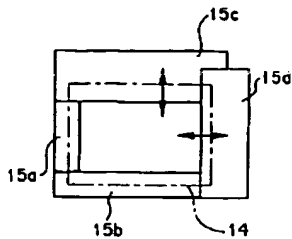


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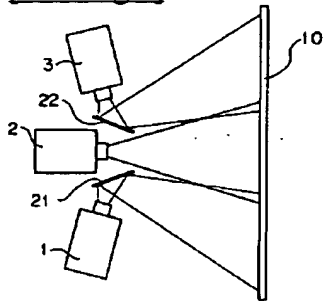


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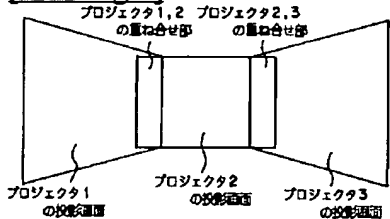
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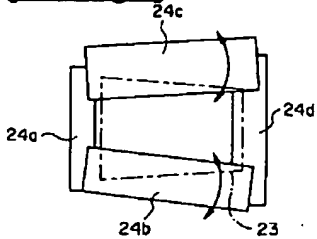
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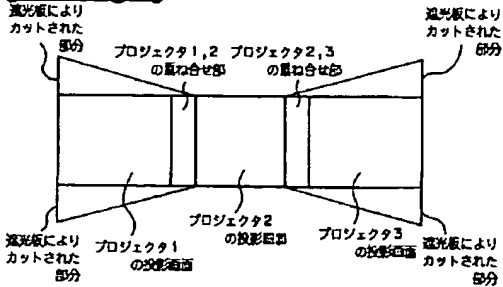
[Drawing 6]



[Drawing 7]

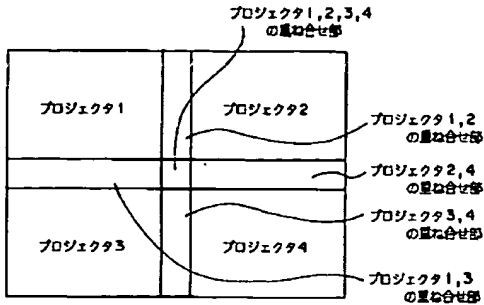


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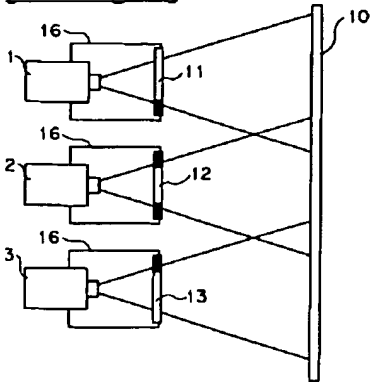


[Drawing 10]

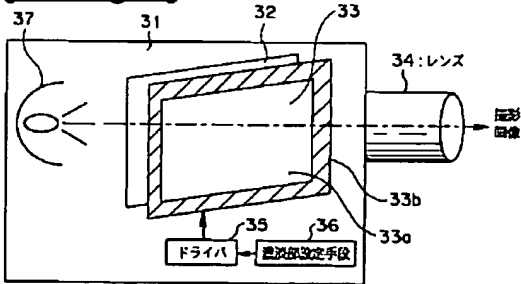
図 11



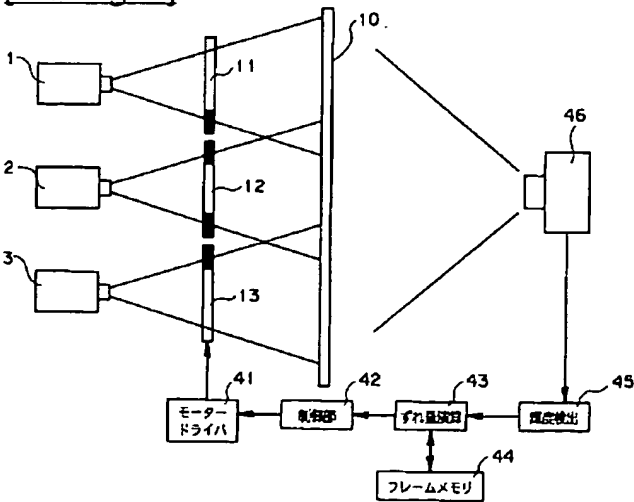
[Drawing 11]



[Drawing 12]

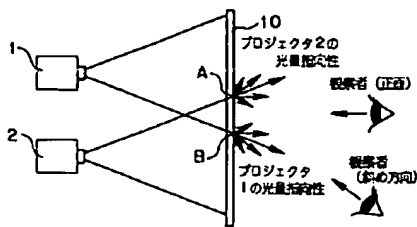


[Drawing 13]



[Drawing 14]

図 1



[Translation done.]

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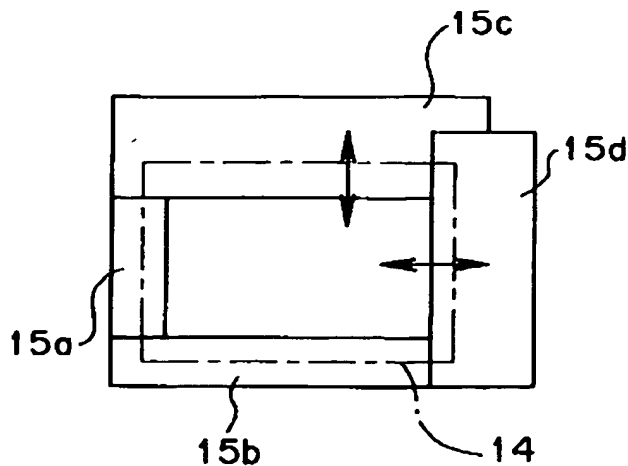
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(54)【発明の名称】 マルチディスプレイ装置、マルチディスプレイシステム、マルチディスプレイ装置の調整方法

(57)【要約】

【課題】 複数の部分画像により構成される画像を重畳領域においてもほぼ均一な輝度として観察することができるマルチディスプレイ装置等を提供する。

【解決手段】 複数のプロジェクタを備え、該プロジェクタによりスクリーンに投影した部分画像をその辺縁において隣接する部分画像に重畳領域をもって重ね合わせながら配列することにより全体として一画像を構成するようになされたマルチディスプレイ装置であって、上記重畳領域の輝度を該重畳領域を除く部分画像の輝度と略一致させるために該重畳領域に向けて投影される光束の一部を遮光する遮光部15aに対して対向する右側を遮光する遮光部15dが水平方向に変位可能であり、同様に、下側を遮光する遮光部15bに対して上側を遮光する遮光部15cが垂直方向に変位可能となるように構成されたマルチディスプレイ装置。



【特許請求の範囲】

【請求項1】 複数の画像投影手段を備え、該画像投影手段によりスクリーンに投影した部分画像をその辺縁において隣接する部分画像に重畳領域をもって重ね合わせながら配列することにより全体として一画像を構成するようになされたマルチディスプレイ装置であって、上記重畳領域の輝度を該重畳領域を除く部分画像の輝度と略一致させるために該重畳領域に向けて投影される光束の光量を調節するものであり、投影される部分画像の、一辺縁に対する他の辺縁の光量調節範囲を変位させ得るようになされた光量調節手段を具備したことを特徴とするマルチディスプレイ装置。

【請求項2】 上記光量調節手段は、投影される部分画像に係る複数の辺縁の光量調節範囲を変位させ得るものであり、これらの変位の方向は、上記画像投影手段から投影される光束に交差する面内における、互いに独立した2方向と回転方向との内の2以上の方向を含んでいることを特徴とする請求項1に記載のマルチディスプレイ装置。

【請求項3】 上記複数の画像投影手段の内の少なくとも一つは、その画像投影方向がスクリーンの主面に立てた法線に交差するように配設されており、上記光量調節手段は、該画像投影手段により投影される部分画像の内の、同画像投影手段をスクリーンの主面に立てた法線方向に投影した場合の部分画像との差異となる部分の光量を調節するように、光量調節範囲を変位させるものであることを特徴とする請求項1に記載のマルチディスプレイ装置。

【請求項4】 上記光量調節手段は、3以上の画像投影手段により投影される部分画像が重ね合わせられてなる重畳領域の輝度を、該重畳領域を除く部分画像の輝度と略一致させるための形状部を有してなることを特徴とする請求項1に記載のマルチディスプレイ装置。

【請求項5】 上記光量調節手段は、重畳領域に向けて投影される光束の少なくとも一部を遮光する遮光板を一以上有してなり、少なくとも一の遮光板が移動可能となるように構成されているものであることを特徴とする請求項1に記載のマルチディスプレイ装置。

【請求項6】 上記光量調節手段は、辺縁から中央に向かって透過率または反射率が、連続的に、または階段状に、高くなる減光フィルタを一以上有してなり、少なくとも一の減光フィルタが移動可能となるように構成されているものであることを特徴とする請求項1に記載のマルチディスプレイ装置。

【請求項7】 上記画像投影手段は、画像を表示する表示素子と、この表示素子を照明する照明手段と、この照明手段により照明された表示素子上の画像を投射する投射光学系と、を有してなり、上記光量調節手段は、上記照明手段から投射光学系に至る光路上に配設されていて、上記重畳領域に投影される

光束の遮光と透光の切り換え、または透過率の変更の少なくとも一方を行う光量調節用液晶パネルを有してなることを特徴とする請求項1に記載のマルチディスプレイ装置。

【請求項8】 上記光量調節手段と上記画像投影手段とを所定の位置関係に維持するべく一体的に固定する固定手段をさらに具備したことを特徴とする請求項1に記載のマルチディスプレイ装置。

【請求項9】 請求項1から請求項8の何れか一項に記載のマルチディスプレイ装置と、

このマルチディスプレイ装置のスクリーンに投影された画像を撮像する撮像手段と、

この撮像手段の撮像信号から輝度信号を抽出して、上記重畳領域の大きさとその輝度とを検出する輝度検出手段と、

この輝度検出手段の出力に基づき、上記光量調節手段により上記光量調節範囲をさらに変位させるべきずれ量を演算するずれ量演算手段と、

このずれ量演算手段により演算されたずれ量に基づき、上記光量調節手段による光量調節範囲を変位させるように制御する制御手段と、

を具備したことを特徴とするマルチディスプレイシステム。

【請求項10】 請求項1から請求項8の何れか一項に記載のマルチディスプレイ装置の調整方法であって、上記マルチディスプレイ装置のスクリーンに投影された画像を撮像して撮像信号を出力するステップと、

上記撮像信号から輝度信号を抽出して、上記重畳領域の大きさとその輝度とを検出するステップと、

検出された重畳領域の大きさとその輝度との情報に基づき、上記マルチディスプレイ装置の光量調節手段により光量調節範囲をさらに変位させるべきずれ量を演算するステップと、

上記ずれ量に基づき、上記光量調節手段による光量調節範囲を変位させるように制御するステップと、

を具備したことを特徴とするマルチディスプレイ装置の調整方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、マルチディスプレイ装置、マルチディスプレイシステム、マルチディスプレイ装置の調整方法、より詳しくは、複数の画像投影手段により投影した部分画像を配列することにより全体として一画像を構成するマルチディスプレイ装置、マルチディスプレイシステム、マルチディスプレイ装置の調整方法に関する。

【0002】

【従来の技術】複数の画像投影手段である画像表示装置を用いて1枚の画像を表示するマルチディスプレイ装置は、従来より種々のものが提案されており、例えば特開

平5-103286号公報、特開平3-53288号公報、特開平9-211386号公報、特開平6-169444号公報等に記載されたものが例として挙げられる。

【0003】このような従来のマルチディスプレイ装置では、複数の画像表示装置により投影された画像同士の繋ぎ目部分が互いに重畳するように構成されていて（本発明の実施形態に係る図1等参照）、さらにこの重畳部分の輝度が高くなってしまうことのないように、画像表示装置（プロジェクタ）とスクリーンの間に、プロジェクタによる投影範囲の端部を遮光する遮光板を配置して、光量の減光を行うようにしている。

【0004】

【発明が解決しようとする課題】しかしながら、上述したような従来の技術では、互いに重ね合わせられる複数の画像表示装置の光量を、同量だけ遮光するように遮光板を配置するのは困難であり、製造時等に一度調整して配置したとしても、その後のランプ交換時に画像表示装置をマルチディスプレイ装置から移動したり取り外したりすると、遮光板との位置関係を再度調整しなければならず、この調整に時間を要するという課題が生じていた。

【0005】また、図14に示すように、複数のプロジェクタ1、2の各光軸が、スクリーン10の主面に垂直となるように画像をそれぞれ投影すると、各プロジェクタ1、2による部分画像の辺縁に位置する重ね合せ部（重畳領域）に到達する光は、プロジェクタ1からのものとプロジェクタ2からのものとで指向性が異なることになる。

【0006】このような光を上記スクリーン10の拡散面（図14におけるA点での拡散光とB点での拡散光を参照）で拡散させると、入射光と同一方向に最も大きな光量として拡散され、入射方向から角度が離れるに従って光量が減衰するようにして拡散されるために、正面からの観察者にとっては重ね合せ部で輝度が不自然に不連続になることはないが、例えば図示のような斜めからの観察者の場合には、プロジェクタ1からの光量に対してプロジェクタ2からの光量が小さくなって、不自然な不連続性として観察されてしまうことになる。

【0007】本発明は上記事情に鑑みてなされたものであり、複数の部分画像により構成される画像を、重畳領域においてもほぼ均一な輝度として観察することができるマルチディスプレイ装置、マルチディスプレイシステム、マルチディスプレイ装置の調整方法を提供することを目的としている。

【0008】

【課題を解決するための手段】上記の目的を達成するために、第1の発明によるマルチディスプレイ装置は、複数の画像投影手段を備え該画像投影手段によりスクリーンに投影した部分画像をその辺縁において隣接する部分

画像に重畳領域をもって重ね合わせながら配列することにより全体として一画像を構成するようになされたマルチディスプレイ装置であって、上記重畳領域の輝度を該重畳領域を除く部分画像の輝度と略一致させるために該重畳領域に向けて投影される光束の光量を調節するものであり、投影される部分画像の、一辺縁に対する他の辺縁の光量調節範囲を変位させ得るようになされた光量調節手段を備えたものである。

【0009】また、第2の発明によるマルチディスプレイ装置は、上記第1の発明によるマルチディスプレイ装置において、上記光量調節手段が、投影される部分画像に係る複数の辺縁の光量調節範囲を変位させ得るものであり、これらの変位の方向は、上記画像投影手段から投影される光束に交差する面内における、互いに独立した2方向と回転方向との内の2以上の方向を含んだものである。

【0010】さらに、第3の発明によるマルチディスプレイ装置は、上記第1の発明によるマルチディスプレイ装置において、上記複数の画像投影手段の内の少なくとも一つはその画像投影方向がスクリーンの主面に立てた法線に交差するように配設されており、上記光量調節手段は、該画像投影手段により投影される部分画像の内の、同画像投影手段をスクリーンの主面に立てた法線方向に投影した場合の部分画像との差異となる部分の光量を調節するように、光量調節範囲を変位させるものである。

【0011】第4の発明によるマルチディスプレイ装置は、上記第1の発明によるマルチディスプレイ装置において、上記光量調節手段が、3以上の画像投影手段により投影される部分画像が重ね合わせられてなる重畳領域の輝度を、該重畳領域を除く部分画像の輝度と略一致させるための形状部を有してなるものである。

【0012】第5の発明によるマルチディスプレイ装置は、上記第1の発明によるマルチディスプレイ装置において、上記光量調節手段が、重畳領域に向けて投影される光束の少なくとも一部を遮光する遮光板を一以上有してなり、少なくとも一の遮光板が移動可能となるように構成されているものである。

【0013】第6の発明によるマルチディスプレイ装置は、上記第1の発明によるマルチディスプレイ装置において、上記光量調節手段が、辺縁から中央に向かって透過率または反射率が、連続的に、または階段状に、高くなる減光フィルタを一以上有してなり、少なくとも一の減光フィルタが移動可能となるように構成されているものである。

【0014】第7の発明によるマルチディスプレイ装置は、上記第1の発明によるマルチディスプレイ装置において、上記画像投影手段が画像を表示する表示素子とこの表示素子を照明する照明手段とこの照明手段により照明された表示素子上の画像を投射する投射光学系とを有

してなり、上記光量調節手段は、上記照明手段から投射光学系に至る光路上に配設されていて、上記重畳領域に投影される光束の遮光と透光の切り換えまたは透過率の変更の少なくとも一方を行う光量調節用液晶パネルを有してなるものである。

【0015】第8の発明によるマルチディスプレイ装置は、上記第1の発明によるマルチディスプレイ装置において、上記光量調節手段と上記画像投影手段とを所定の位置関係に維持するべく一体的に固定する固定手段をさらに備えたものである。

【0016】第9の発明によるマルチディスプレイシステムは、第1の発明から第8の発明の何れかに記載のマルチディスプレイ装置と、このマルチディスプレイ装置のスクリーンに投影された画像を撮像する撮像手段と、この撮像手段の撮像信号から輝度信号を抽出して上記重畳領域の大きさとその輝度とを検出する輝度検出手段と、この輝度検出手段の出力に基づき上記光量調節手段により上記光量調節範囲をさらに変位させるべきずれ量を演算するずれ量演算手段と、このずれ量演算手段により演算されたずれ量に基づき上記光量調節手段による光量調節範囲を変位させるように制御する制御手段と、を備えたものである。

【0017】第10の発明によるマルチディスプレイ装置の調整方法は、第1の発明から第8の発明の何れかに記載のマルチディスプレイ装置の調整方法であって、上記マルチディスプレイ装置のスクリーンに投影された画像を撮像して撮像信号を出力するステップと、上記撮像信号から輝度信号を抽出して上記重畳領域の大きさとその輝度とを検出するステップと、検出された重畳領域の大きさとその輝度との情報に基づき上記マルチディスプレイ装置の光量調節手段により光量調節範囲をさらに変位させるべきずれ量を演算するステップと、上記ずれ量に基づき上記光量調節手段による光量調節範囲を変位させるように制御するステップと、を備えたものである。

【0018】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態を説明する。図1から図4は本発明の第1の実施形態を示したものであり、図1はマルチディスプレイ装置の構成の概要を示す斜視図である。

【0019】このマルチディスプレイ装置は、例えば9個の画像投影手段たるプロジェクタ1～9を3×3の配列となるように設置しており、これらのプロジェクタ1～9の投影位置には透過型のスクリーン10が配設されている。このとき、各プロジェクタ1～9による投影範囲は、その辺縁において、隣接するプロジェクタによる投影範囲と重畳される部分を有するように投影されている。

【0020】このときのプロジェクタ1～3による投影範囲を取り出して、重畳される重ね合せ部（重畳領域）

の様子を示すのが図2である。図2は、横方向に並列された3つのプロジェクタの各投射範囲と重ね合せ部の様子を示す図である。

【0021】横方向においては、プロジェクタ1の投射範囲は、プロジェクタ2の投射範囲と重ね合せ部において一部重複しており、また、プロジェクタ3の投射範囲は、プロジェクタ2の投射範囲と反対側の重ね合せ部において一部重複している。

【0022】このような投射範囲のマルチディスプレイ装置においては、何らの工夫をしない場合には、重ね合せ部の輝度が、重ね合せ部以外の部分の約2倍となってしまうために、遮光板を設けて重ね合せ部に投影される各プロジェクタの光を減光するようにした様子を示すのが図3である。

【0023】図3は、重ね合せ部に投射される光を遮光板により減光する様子を示す平面図である。

【0024】プロジェクタ1～3が図示のように配列されている場合には、上述したように、プロジェクタ2が、その投影範囲の一方の側においてプロジェクタ1と重ね合せ部を有し、他方の側においてプロジェクタ3と重ね合せ部を有する。

【0025】そこで、この重ね合せ部に到達する光束の通過経路上に、図示のように遮光板を配置する。

【0026】すなわち、プロジェクタ1に対する光量調節手段たる遮光板11は、プロジェクタ2の投影範囲との重ね合せ部に到達する光束の通過経路上に位置するように、遮光部11aを配置したものとして構成されている。

【0027】また、プロジェクタ2に対する光量調節手段たる遮光板12は、プロジェクタ1の投影範囲との重ね合せ部に到達する光束の通過経路上に位置するように遮光部12aを配置し、かつ、プロジェクタ3の投影範囲との重ね合せ部に到達する光束の通過経路上に位置するように遮光部12bを配置したものとして構成されている。

【0028】さらに、プロジェクタ3に対する光量調節手段たる遮光板13は、プロジェクタ2の投影範囲との重ね合せ部に到達する光束の通過経路上に位置するように、遮光部13aを配置したものとして構成されている。

【0029】このような遮光板11、12、13は、上記プロジェクタ1、2、3とスクリーン10との間の光路上に配置されていて、この位置は非焦点面となっているために、遮光部による遮光の効果は、グラディエーションをもったなだらかな遮光効果として、焦点面に配設されたスクリーン10上に現れる。

【0030】すなわち、例えばプロジェクタ1とプロジェクタ2の非重ね合せ部の相対的な輝度を1とすると、これらプロジェクタ1とプロジェクタ2との重ね合せ部において、プロジェクタ1の非重ね合せ部に近接する部

分では、プロジェクタ1により投影された画像の輝度は1に近いものとなり、プロジェクタ2により投影された画像の輝度は0に近いものとなって、これらが重畳してほぼ1の輝度の画像として表示されることになる。

【0031】同様に、プロジェクタ1とプロジェクタ2との重ね合せ部において、プロジェクタ2の非重ね合せ部に近接する部分では、プロジェクタ1により投影された画像の輝度は0に近いものとなり、プロジェクタ2により投影された画像の輝度は1に近いものとなって、これらが重畳してほぼ1の輝度の画像として表示されることになる。

【0032】そして、プロジェクタ1とプロジェクタ2との重ね合せ部において、ほぼ中間位置となる部分では、プロジェクタ1により投影された画像の輝度は0.5に近いものとなり、プロジェクタ2により投影された画像の輝度は0.5に近いものとなって、やはり、これらが重畳してほぼ1の輝度の画像として表示されることになる。

【0033】こうして、重ね合せ部においては、隣接するプロジェクタによる映像同士が滑らかに連結されて、かつその輝度が非重ね合せ部とほぼ同様の輝度となるために、不連続性のない滑らかな画像を観察することが可能となる。

【0034】このとき、プロジェクタ同士の配置間隔や配置角度などにより上記重ね合せ部が決まってくるために、遮光板は、こうしたプロジェクタの配置に応じてその遮光部の位置を決定しなければならない。こうした遮光部の配置を正確に位置決めすることができるように、本実施形態の遮光板は、その遮光部の一部を可変とする構成となっている。

【0035】この可変となるように構成された遮光板の構成について、図4を参照して説明する。図4は、矩形状をなす投射範囲の4辺縁を遮光するための遮光板の構成を示す正面図である。

【0036】この図4に示す遮光板の構成は、例えば上記図1に示したようなプロジェクタの配置例におけるプロジェクタ5に対応するものとなっている。

【0037】プロジェクタ5は、上側でプロジェクタ2の画像と、下側でプロジェクタ8の画像と、右側でプロジェクタ6の画像と、左側でプロジェクタ4の画像と、それぞれ重ね合せ部を有することになるために、該プロジェクタ5に対応する遮光板は、矩形状をなす画像の4つの辺縁を全て遮光することができるように構成されている。

【0038】すなわち、プロジェクタ5による投射範囲14の例えば左側辺縁を覆う遮光部15aと下側辺縁を覆う遮光部15bは、一体化してし字形状となるように構成されており、これに対して、矩形の板状部材でなる上側辺縁を覆う遮光部15cと右側辺縁を覆う遮光部15dは、それぞれ別体で移動可能となるように配設され

ている。

【0039】すなわち、遮光部15cは、上下方向に移動可能となるように設けられており、これによって、遮光部15bとの間隔を変化させることができるようになっている。

【0040】また、遮光部15dは、左右方向に移動可能となるように設けられており、これによって、遮光部15aとの間隔を変化させることができるようになっている。

10 【0041】なお、この図4に示した例では、対向する2組の辺縁の、各組の一方の辺縁の遮光部のみを移動可能としたが、4辺縁の遮光部を全て移動可能としても構わない。

【0042】また、重ね合せ部が3つ以下の辺縁となるプロジェクタに対応する遮光板、つまり、図1の例におけるプロジェクタ1, 2, 3, 4, 6, 7, 8, 9に対応する遮光板も、この図4に示したような遮光板に準じて、必要な遮光部を有する構成となっていることは同様である。

20 【0043】さらに、上述では遮光板を光を完全に遮光するものとして構成したが、これに限らず、例えば辺縁から中央に向かって透過率が徐々に高くなるような減光フィルタ、または辺縁から中央に向かって透過率が階段状に高くなるような減光フィルタ等で構成するようにしても良い。

【0044】このような第1の実施形態によれば、遮光板を移動可能に設けることにより、重ね合せ部の重畳幅を簡単に調整して輝度調節することが可能となり、短い調整時間で、画面全体の輝度を容易に均一化することができる。こうして、重ね合せ部においても輝度が円滑に

30 接続される高品質の画像を表示することができるマルチディスプレイ装置となる。

【0045】図5から図8は本発明の第2の実施形態を示したものであり、図5はスクリーンへの入射光の指向性を改善するための構成を示す平面図である。この第2の実施形態において、上述の第1の実施形態と同様である部分については同一の符号を付して説明を省略し、主として異なる点についてのみ説明する。

40 【0046】上述したように、スクリーン10で拡散される光量は、入射光の方向に依存した指向性をもち、光軸が平行となるように配設されたプロジェクタから投影される画像の重ね合せ部においては、この指向性により、斜めから観察したときに輝度が不連続に観察されることがある。

【0047】こうした課題を改善するための構成がこの図5に示すようなプロジェクタの配置である。

【0048】図示のように、中央に配設されるプロジェクタ2は、スクリーン10の主面に対してほぼ垂直な方向に画像を投影するようになっている。

50 【0049】このプロジェクタ2の画像を投影するレン

ズの近傍には、反射鏡21、22が配設されていて、一方の反射鏡21はプロジェクタ1から投影される画像を反射するためのもの、他方の反射鏡22はプロジェクタ3から投影される画像を反射するためのものとなっている。

【0050】すなわち、プロジェクタ1により投影された画像は、反射鏡21により反射された後にスクリーン10上に、上記プロジェクタ2から投影される画像と所定範囲の重ね合せ部を有するように投影される。

【0051】同様に、プロジェクタ3により投影された画像は、反射鏡22により反射された後にスクリーン10上に、上記プロジェクタ2から投影される画像と所定範囲の重ね合せ部を有するように投影される。

【0052】このようにプロジェクタ1、3および反射鏡21、22を配設することにより、重ね合せ部において、プロジェクタ1から投影される光とプロジェクタ2から投影される光とはほぼ同一方向にスクリーン10に入射し、プロジェクタ3から投影される光とプロジェクタ2から投影される光もほぼ同一方向にスクリーン10に入射することになるために、それぞれの重ね合せ部から出射される拡散光の光量指向性に大きな不連続性が生じることはなく、正面から観察したときだけでなく、斜め方向から観察したときにも不連続に輝度が変化して見えることはない。

【0053】図6は、上記図5に示すように配置されたプロジェクタによるスクリーンへの投影画面の様子を示す図である。

【0054】上記図5に示すような配置のプロジェクタ1、2、3によりスクリーン10に矩形の画像を投影すると、プロジェクタ2の画像は矩形のままの投影画面となるが、プロジェクタ1の画像およびプロジェクタ3の画像は、斜め方向に投影されることになるために、図示のように等脚台形状の映像となってしまう。

【0055】そこで、図7に示すような遮光板を用いて遮光を行っている。図7は、スクリーンに対して斜交した方向から投射するプロジェクタの光束を矩形状の画像として投影されるように遮蔽する遮光板の構成を示す正面図である。

【0056】図7に示すように、対向する1組の遮光部24a、24dは、プロジェクタ1による投射範囲23の垂直方向の辺縁を遮光するためのものである。これらの内の一方の遮光部24aは、合成される画面の外側、つまりプロジェクタ2の投影画面とは反対側の遮光を行うためのものであり、この辺縁の側には重ね合せ部はないために、遮光を行わなくても構わない。他方の遮光部24dは、プロジェクタ2の投影画面との重ね合せ部に到達する光束を遮光するためのものである。

【0057】また、対向する他の1組の遮光部24b、24cは、プロジェクタ1による投射範囲23の略水平方向の辺縁を遮光するためのものであり、一方の遮光部

24bは下辺側を遮光し、他方の遮光部24cは上辺側を遮光するものである。

【0058】このとき、これら遮光部24b、24cは、回転方向に変位可能となるように構成されていて、遮光後の投影画面が図8に示すようなものとなるように、位置調節可能となっている。

【0059】図8は、上記図7に示したような遮光板により上記図6の投影画面を遮光したときの様子を示す図である。

【0060】また、これらの遮光部24a、24b、24c、24dでなる遮光板が、プロジェクタ1とスクリーン10との間の途中の光路中に配設されていて、該遮光板を通過した後も、光束がスクリーン10に向けてさらに広がることを考慮して、遮光部24bと遮光部24cとの間隔は、図7の左側が狭く、右側が広がるように調整される。これにより、遮光されることなく投影される範囲が、スクリーン10に到達したときには、上記図8に示すように矩形状となる。

【0061】このとき、この図8に示す遮光されない範囲の投影画像が複数プロジェクタによる分割画像となるように、プロジェクタ内の液晶表示パネル等に表示する画像を変換していることは勿論である。また、プロジェクタ1やプロジェクタ3による画像は、反射鏡21、22により反射されるために、プロジェクタ内の液晶表示パネル等に表示する画像が反転されていることはいうまでもない。

【0062】なお、上述したように反射鏡を用いる構成では、該反射鏡上に、辺縁を遮光するマスクあるいは反射率を変化させるマスクを設けることも可能である。マスクの反射率を変化させる場合には、辺縁から中央に向かう反射率が、連続的に高くなるようにしても良いし、または階段状に高くなるようにしても構わない。

【0063】また、上述したような反射鏡を回動可能となるように構成すれば、該反射鏡の角度を調整することで、重ね合せ位置の調整を容易に行うこともできる。

【0064】このような第2の実施形態によれば、上述した第1の実施形態とほぼ同様の効果を奏するとともに、スクリーンにより拡散される光の光量が、拡散される方向に依存することに起因する輝度の不連続性を軽減することができ、斜め方向からでも滑らかに連続した輝度の画像を観察することが可能となる。

【0065】図9、図10は本発明の第3の実施形態を示したものであり、図9は4つのプロジェクタによる投影画面が辺縁の角部において重なる場合に有効に用いられる遮光板の構成を示す正面図、図10は4つのプロジェクタによる投影画面の様子を示す図である。

【0066】この第3の実施形態において、上述の第1、第2の実施形態と同様である部分については同一の符号を付して説明を省略し、主として異なる点についてのみ説明する。

【0067】プロジェクタを上下左右に平面状に配列する場合には、2つ以上のプロジェクタによる投影画面が重なる部分が生じることになる。簡単のために、4つのプロジェクタの場合について考えると、例えば図10に示すように、プロジェクタ1による投影画面が左上に、プロジェクタ2による投影画面が右上に、プロジェクタ3による投影画面が左下に、プロジェクタ4による投影画面が右下に、それぞれ位置する場合には、2つのプロジェクタによる重ね合せ部が4ヶ所、4つのプロジェクタによる重ね合せ部が1ヶ所生じる。

【0068】すなわち、プロジェクタ1の投影画面とプロジェクタ2の投影画面との間、プロジェクタ1の投影画面とプロジェクタ3の投影画面との間、プロジェクタ2の投影画面とプロジェクタ4の投影画面との間、プロジェクタ3の投影画面とプロジェクタ4の投影画面との間、に2つの画像の重ね合せ部が生じるとともに、さらに4つの投影画像の各角部が重ね合わさる部分に4つの画像の重ね合せ部が生じる。

【0069】このとき、この4つの画像の重ね合せ部は、他の部分よりも輝度が高くなってしまうことがあるために、それを他の部分の輝度と同程度にするための遮光板の構成を示すのが図9である。

【0070】この光量調節手段たる遮光板26は、例えばプロジェクタ1に対応するものであり、略し字状に形成されてプロジェクタ3との重ね合せ部、およびプロジェクタ2との重ね合せ部を遮光するように形成されると共に、そのし字状をなす角部に略三角形形状の形状部たる遮光部位26aを設けて、4つの画像の重ね合せ部に到達する光をさらに減光するようにしたものである。

【0071】このような遮光部位26aを設けることにより、図10に示すような画面全体で、ほぼ均一な輝度の画像を得ることができる。

【0072】このような第3の実施形態によれば、上述した第1、第2の実施形態とほぼ同様の効果を奏するとともに、3つ以上のプロジェクタによる重ね合せ部の輝度が高くなりすぎるのを適切に調節して、画面全体がほぼ均一な輝度となる画像を観察することが可能となる。

【0073】図11は本発明の第4の実施形態を示したものであり、プロジェクタと遮光板とを一体化して所定の位置関係を保持するようにした構成を示す平断面図である。この第4の実施形態において、上述の第1から第3の実施形態と同様である部分については同一の符号を付して説明を省略し、主として異なる点についてのみ説明する。

【0074】プロジェクタは、例えば内部に画像表示用の透過型液晶表示パネルを有し、該透過型液晶表示パネルを背面側からランプ等の照明手段により照明するようになっている。このような構成のプロジェクタでは、長期間の使用によりランプの輝度が低下したり、あるいはランプが点灯しなくなったりして、交換することになる

場合がある。

【0075】このときに、マルチディスプレイ装置からプロジェクタを取り外して、内部のランプを交換することになるが、交換後に再びプロジェクタを取り付けても、プロジェクタと遮光板との位置関係が微妙に変化してしまい、再調整が必要となってランプ交換作業を行うのに手間がかかることになる。

【0076】そこで、この図11に示す構成は、プロジェクタと遮光板を筐体を用いて一体化することにより、ランプ交換時等にも位置関係が変化することのないように構成したものである。

【0077】すなわち、プロジェクタ1と遮光板11、プロジェクタ2と遮光板12、プロジェクタ3と遮光板13は、それぞれ固定手段たる筐体16を介して互いの位置関係が一定となるように固定されている。

【0078】そして、プロジェクタをマルチディスプレイ装置から取り外す際には、筐体16を介して固定されている遮光板と一体に取り外されるようになっている。

【0079】なお、ここでは各プロジェクタを、該プロジェクタに対応する遮光板と一体化したが、さらに、プロジェクタ同士の位置関係なども一定となるように、全てのプロジェクタを全ての遮光板と共に、同一の筐体に固定するようにしても構わない。

【0080】このような第4の実施形態によれば、上述した第1から第3の実施形態とほぼ同様の効果を奏するとともに、ランプ交換やその他の修理などの際に必要となる調整時間を、大幅に短縮することが可能となる。

【0081】図12は本発明の第5の実施形態を示したものであり、プロジェクタの内部に光量調節用液晶パネルを設けて辺縁の遮光を行うようにした構成を示す図である。この第5の実施形態において、上述の第1から第4の実施形態と同様である部分については同一の符号を付して説明を省略し、主として異なる点についてのみ説明する。

【0082】上述では、遮光板をプロジェクタとスクリーンとの間に設けたが、これに限らず、プロジェクタの内部に配設することも可能である。

【0083】すなわち、画像投影手段たるプロジェクタ31は、画像を表示する表示素子たる透過型液晶表示パネル32と、この透過型液晶表示パネル32を照明するための照明手段たるランプ37と、上記透過型液晶表示パネル32により表示された画像を投影する投射光学系たるレンズ34と、を有して構成され、上記ランプ37とレンズ34との間の光路上、より限定的には、上記透過型液晶表示パネル32とレンズ34との間の光路上に、該透過型液晶表示パネル32により表示される画像の辺縁から発せられる光束を遮光しあるいは減光するための光量調節手段たる光量調節用液晶パネル33が配設されている。

【0084】この光量調節用液晶パネル33は、光をほ

ばそのまま透過させる透過部33aと、この透過部33aの周辺側の透過光量を調節する遮光部33bとを有して構成されていて、ドライバ35により駆動されるようになっている。

【0085】濃淡部設定手段36は、上記遮光部33bの遮光範囲や、遮光時の濃淡などを設定するものであり、設定されたデータが上記ドライバ35に出力されて、該ドライバ35により、光量調節用液晶パネル33の制御が行われる。

【0086】このような第5の実施形態によれば、上述した第1から第4の実施形態とほぼ同様の効果を奏するとともに、プロジェクト内に遮光機能を有する光量調節用液晶パネルを配設することにより、ランプ交換時等にも透過型液晶表示パネルとの位置関係が変化することではなく、調整時間を短縮することが可能となる。そして、電気的な制御のみで調整が可能であるために、機械的な制御を行う必要がなくなり、機構が簡単となって装置を小型化することも可能となる。

【0087】図13は本発明の第6の実施形態を示したものであり、マルチディスプレイ装置を輝度調整するためのマルチディスプレイシステムの構成を示すブロック図である。この第6の実施形態において、上述の第1から第5の実施形態と同様である部分については同一の符号を付して説明を省略し、主として異なる点についての説明する。

【0088】上述したようなマルチディスプレイ装置は、出荷時やあるいはランプ交換時などに、上記重ね合せ部の輝度が均一となるように、上記遮光板などの位置調整をする必要がある。そこで、こうした輝度調整を行うための構成を示すのがこの図13である。

【0089】プロジェクト1, 2, 3により各投影される部分画像は、遮光板11, 12, 13をそれぞれ介してスクリーン10に結像する。

【0090】このスクリーン10上の画像全体を、例えばデジタルカメラ46などの撮像手段により撮像して、その画像信号から輝度検出手段たる輝度検出部45が輝度信号を抽出して、該輝度信号に基づき重ね合せ部の重なり幅や位置を検出する。

【0091】ずれ量演算手段たるずれ量演算部43は、上記輝度検出部45の出力に基づき、画面全体の輝度が均一でない場合には、その不均一部分の輝度を補正するために、上記遮光板11, 12, 13をどの程度移動させればよいかを示すずれ量を、フレームメモリ44に記憶されているデータを参照しながら算出する。

【0092】制御手段たる制御部42は、このずれ量演算部43により算出されたずれ量に基づいて、モータドライバ41を駆動し、遮光板11, 12, 13を駆動して位置調整することにより、輝度を調整して均一化している。

【0093】なお、光量調節手段が、上記第5の実施形

態に示したような光量調節用液晶パネルでなる場合には、制御部42は、ドライバを介して電気的に制御を行わせることになる。

【0094】このような第6の実施形態によれば、上述した第1から第5の実施形態とほぼ同様の効果を奏するとともに、出荷時や、あるいはランプ交換やその他の修理時などにおいて輝度調整を行う場合にも、デジタルカメラ等でスクリーンの撮像を行うだけで、自動的に調整することが可能となり、作業時間を短縮することが可能となる。

【0095】なお、本発明は上述した実施形態に限定されるものではなく、発明の主旨を逸脱しない範囲内において種々の変形や応用が可能であることは勿論である。

【0096】

【発明の効果】以上説明したように請求項1による本発明のマルチディスプレイ装置によれば、画像投影手段により投影される部分画像の一辺縁に対する他の辺縁の光量調節範囲を変位させることができるために、複数の部分画像により構成される画像を、重畳領域においてもほぼ均一な輝度として観察することが可能となる。

【0097】また、請求項2による本発明のマルチディスプレイ装置によれば、請求項1に記載の発明と同様の効果を奏するとともに、所望の方向や回転方向に変位させることができるために、最適な光量調節をきめ細かに行うことができる。

【0098】さらに、請求項3による本発明のマルチディスプレイ装置によれば、請求項1に記載の発明と同様の効果を奏するとともに、異なる画像投影手段から重畳領域に投影される光の方向を、ほぼ同一方向とすることが可能となり、スクリーンを斜め方向から観察したときの輝度を連続とすることができる。

【0099】請求項4による本発明のマルチディスプレイ装置によれば、請求項1に記載の発明と同様の効果を奏するとともに、形状部によって、3以上の画像投影手段により投影される部分画像が重ね合わせられてなる重畳領域の輝度を、該重畳領域を除く部分画像の輝度と略一致させることができ、全体として均一な輝度の画像を観察することが可能となる。

【0100】請求項5による本発明のマルチディスプレイ装置によれば、遮光板を用いることにより、請求項1に記載の発明と同様の効果を奏することができる。

【0101】請求項6による本発明のマルチディスプレイ装置によれば、請求項1に記載の発明と同様の効果を奏するとともに、減光フィルタを用いることにより、所望の光量調節状態を得ることができる。

【0102】請求項7による本発明のマルチディスプレイ装置によれば、請求項1に記載の発明と同様の効果を奏するとともに、光量調節用液晶パネルを有してなる光量調節手段を照明手段から投射光学系に至る光路上に配設することにより、所望の光量調節状態を得ることがで

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きるとともに、小型化を図ることが可能となる。

【0103】請求項8による本発明のマルチディスプレイ装置によれば、請求項1に記載の発明と同様の効果を奏するとともに、固定手段により光量調節手段と画像投影手段とを一体的に固定して所定の位置関係に維持しているために、保守や修理時における調整時間を短縮することが可能となる。

【0104】請求項9による本発明のマルチディスプレイシステムによれば、スクリーンに投影された画像を撮像して、重畳領域の大きさとその輝度とを検出し、ずれ量を演算して、光量調節手段により光量調節範囲を変位させるように制御するために、自動的な調整作業が可能となる。

【0105】請求項10による本発明のマルチディスプレイ装置の調整方法によれば、スクリーンに投影された画像を撮像して、重畳領域の大きさとその輝度とを検出し、ずれ量を演算して、光量調節手段により光量調節範囲を変位させるように制御するために、自動的な調整作業が可能となる。

【図面の簡単な説明】

【図1】本発明の第1の実施形態におけるマルチディスプレイ装置の構成の概要を示す斜視図。

【図2】上記第1の実施形態において、横方向に並列された3つのプロジェクタの各投射範囲と重ね合せ部の様子を示す図。

【図3】上記第1の実施形態において、重ね合せ部に投射される光を遮光板により減光する様子を示す平面図。

【図4】上記第1の実施形態において、矩形状をなす投射範囲の4辺縁を遮光するための遮光板の構成を示す正面図。

【図5】本発明の第2の実施形態において、スクリーンへの入射光の指向性を改善するための構成を示す平面図。

【図6】上記第2の実施形態において、上記図5に示すように配置されたプロジェクタによるスクリーンへの投影画面の様子を示す図。

【図7】上記第2の実施形態において、スクリーンに対して斜交した方向から投射するプロジェクタの光束を矩形状の画像として投影されるように遮蔽する遮光板の構成を示す正面図。

【図8】上記第2の実施形態において、上記図7に示したような遮光板により上記図6の投影画面を遮光したときの様子を示す図。

【図9】本発明の第3の実施形態において、4つのプロジェクタによる投影画面が辺縁の角部において重なる場合に有効に用いられる遮光板の構成を示す正面図。

【図10】上記第3の実施形態において、4つのプロジェクタによる投影画面の様子を示す図。

【図11】本発明の第4の実施形態において、プロジェクタと遮光板とを一体化して所定の位置関係を保持するようにした構成を示す平断面図。

【図12】本発明の第5の実施形態において、プロジェクタの内部に光量調節用液晶パネルを設けて辺縁の遮光を行うようにした構成を示す図。

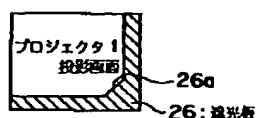
【図13】本発明の第6の実施形態において、マルチディスプレイ装置を輝度調整するためのマルチディスプレイシステムの構成を示すブロック図。

【図14】従来において、プロジェクタを平行に配列してスクリーンに像を投影したときに、光量指向性により、斜め方向から見たときに輝度が異なる様子を示す図。

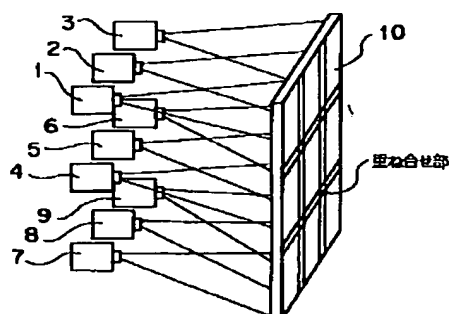
【符号の説明】

- 1, 2, 3, 4, 5, 6, 7, 8, 9, 31…プロジェクタ（画像投影手段）
- 10…スクリーン
- 11, 12, 13, 26…遮光板（光量調節手段）
- 11a, 12a, 12b, 13a, 15a, 15b, 15c, 15d, 24a, 24b, 24c, 24d…遮光部（遮光板の一部）
- 16…筐体（固定手段）
- 21, 22…反射鏡
- 26a…遮光部位（形状部）
- 30 32…透過型液晶表示パネル（表示素子）
- 33…光量調節用液晶パネル（光量調節手段）
- 33a…透過部
- 33b…遮光部
- 34…レンズ（投射光学系）
- 35…ドライバ
- 36…濃淡部設定手段
- 37…ランプ（照明手段）
- 41…モータドライバ
- 42…制御部（制御手段）
- 40 43…ずれ量演算部（ずれ量演算手段）
- 44…フレームメモリ
- 45…輝度検出部（輝度検出手段）
- 46…デジタルカメラ（撮像手段）

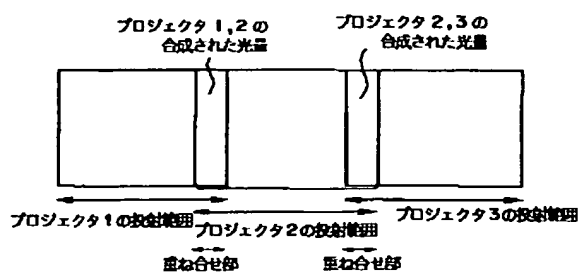
【図9】



【図1】



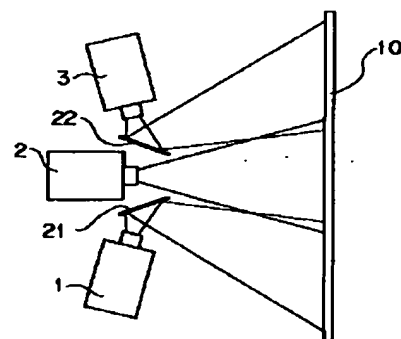
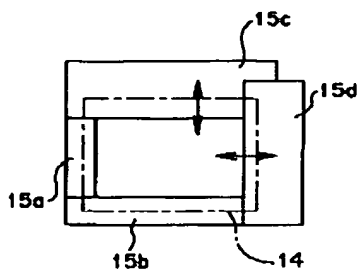
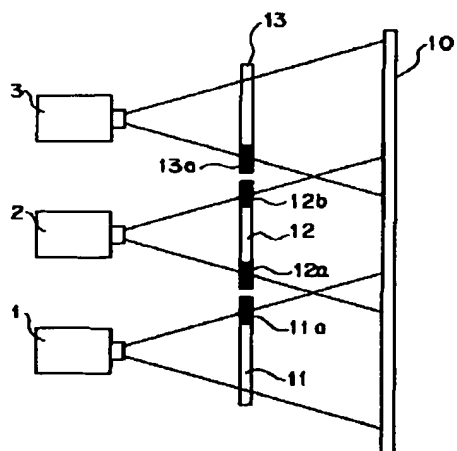
【図2】



【図4】

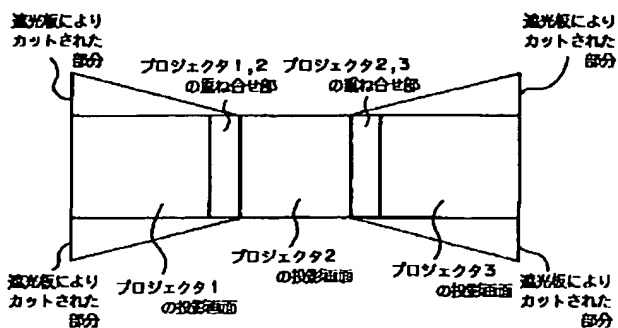
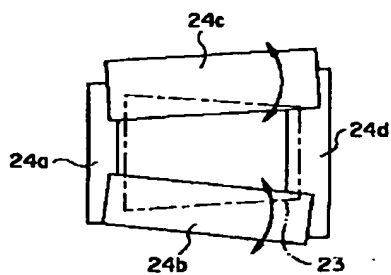
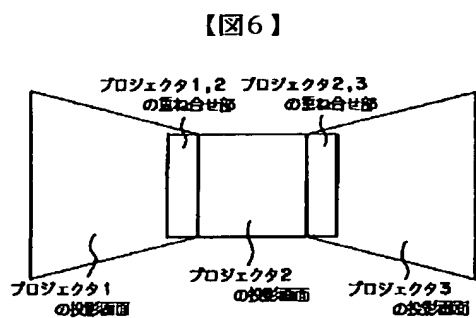
【図5】

【図3】

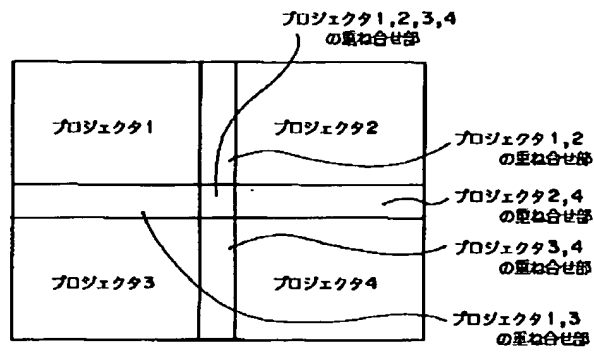


【図7】

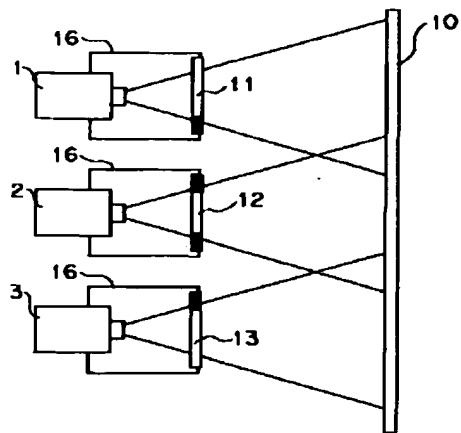
【図8】



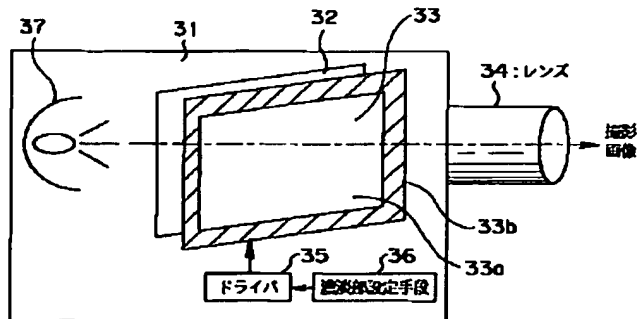
【図10】



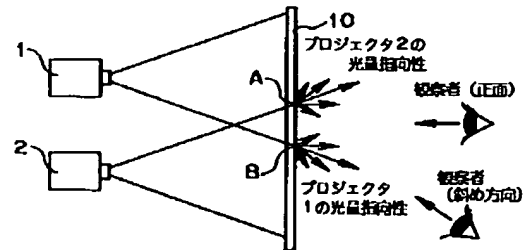
【図11】



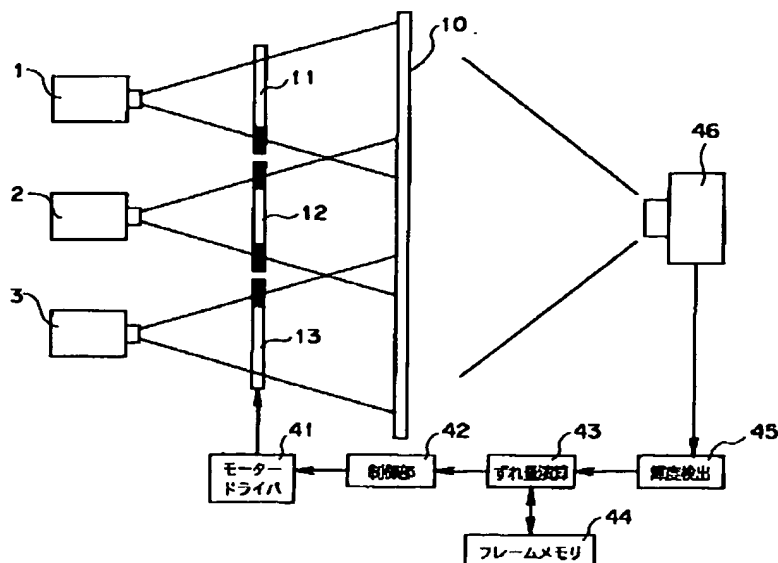
【図12】



【図14】



【図13】



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